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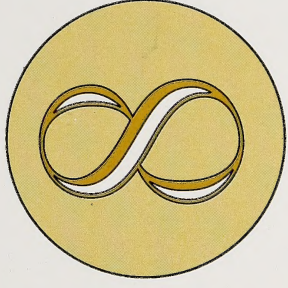


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MATHEMATICS

CANADIANA

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MODULE 4 ALGEBRA



Alberta
EDUCATION

STUDENT SUPPORT GUIDE





Mathematics 8

Module 4: Algebra

STUDENT SUPPORT GUIDE

Note

This Mathematics Learning Facilitator's Manual contains answers to teacher-assessed assignments and the final test; therefore, it should be kept secure by the teacher. Student's should not have access to these assignments or the final test until they are assigned in a supervised situation. The answers should be stored securely by the teacher at all times.

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Student Support Guide
Module 4
Algebra
Alberta Distance Learning Centre
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Module Introduction	Page 1
Section 1: Getting Set	3
Section 2: Translating Words and Phrases	17
Section 3: Evaluating Algebraic Expressions	25
Section 4: Simplifying Algebraic Expressions	37
Section 5: Translating Sentences	45
Section 6: Equations	49
Section 7: Solving Equations Using Additive Inverses	59
Section 8: Solving Equations Using Multiplicative Inverses	67
Section 9: Solving More Equations Using Multiplicative Inverses	73
Section 10: Solving Equations Using Additive and Multiplicative Inverses ..	81
Section 11: Equations with Two Variables	89
Section 12: Relations	97
Section 13: Summary	107
Module Conclusion	109

The first part of the report describes the general situation of the country and the results of the survey. The second part contains the detailed results of the survey, and the third part contains the conclusions and recommendations.

CONTENTS

1. General situation of the country	1
2. Results of the survey	10
3. Detailed results of the survey	15
4. Conclusions and recommendations	25
5. Appendix	30
6. Bibliography	35
7. Index	40
8. Summary	45
9. Acknowledgements	50
10. References	55
11. Appendix	60
12. Bibliography	65
13. Index	70
14. Summary	75
15. Acknowledgements	80
16. References	85
17. Appendix	90
18. Bibliography	95
19. Index	100
20. Summary	105
21. Acknowledgements	110
22. References	115
23. Appendix	120
24. Bibliography	125
25. Index	130
26. Summary	135
27. Acknowledgements	140
28. References	145
29. Appendix	150
30. Bibliography	155
31. Index	160
32. Summary	165
33. Acknowledgements	170
34. References	175
35. Appendix	180
36. Bibliography	185
37. Index	190
38. Summary	195
39. Acknowledgements	200
40. References	205
41. Appendix	210
42. Bibliography	215
43. Index	220
44. Summary	225
45. Acknowledgements	230
46. References	235
47. Appendix	240
48. Bibliography	245
49. Index	250
50. Summary	255
51. Acknowledgements	260
52. References	265
53. Appendix	270
54. Bibliography	275
55. Index	280
56. Summary	285
57. Acknowledgements	290
58. References	295
59. Appendix	300
60. Bibliography	305
61. Index	310
62. Summary	315
63. Acknowledgements	320
64. References	325
65. Appendix	330
66. Bibliography	335
67. Index	340
68. Summary	345
69. Acknowledgements	350
70. References	355
71. Appendix	360
72. Bibliography	365
73. Index	370
74. Summary	375
75. Acknowledgements	380
76. References	385
77. Appendix	390
78. Bibliography	395
79. Index	400
80. Summary	405
81. Acknowledgements	410
82. References	415
83. Appendix	420
84. Bibliography	425
85. Index	430
86. Summary	435
87. Acknowledgements	440
88. References	445
89. Appendix	450
90. Bibliography	455
91. Index	460
92. Summary	465
93. Acknowledgements	470
94. References	475
95. Appendix	480
96. Bibliography	485
97. Index	490
98. Summary	495
99. Acknowledgements	500
100. References	505
101. Appendix	510
102. Bibliography	515
103. Index	520
104. Summary	525
105. Acknowledgements	530
106. References	535
107. Appendix	540
108. Bibliography	545
109. Index	550
110. Summary	555
111. Acknowledgements	560
112. References	565
113. Appendix	570
114. Bibliography	575
115. Index	580
116. Summary	585
117. Acknowledgements	590
118. References	595
119. Appendix	600
120. Bibliography	605
121. Index	610
122. Summary	615
123. Acknowledgements	620
124. References	625
125. Appendix	630
126. Bibliography	635
127. Index	640
128. Summary	645
129. Acknowledgements	650
130. References	655
131. Appendix	660
132. Bibliography	665
133. Index	670
134. Summary	675
135. Acknowledgements	680
136. References	685
137. Appendix	690
138. Bibliography	695
139. Index	700
140. Summary	705
141. Acknowledgements	710
142. References	715
143. Appendix	720
144. Bibliography	725
145. Index	730
146. Summary	735
147. Acknowledgements	740
148. References	745
149. Appendix	750
150. Bibliography	755
151. Index	760
152. Summary	765
153. Acknowledgements	770
154. References	775
155. Appendix	780
156. Bibliography	785
157. Index	790
158. Summary	795
159. Acknowledgements	800
160. References	805
161. Appendix	810
162. Bibliography	815
163. Index	820
164. Summary	825
165. Acknowledgements	830
166. References	835
167. Appendix	840
168. Bibliography	845
169. Index	850
170. Summary	855
171. Acknowledgements	860
172. References	865
173. Appendix	870
174. Bibliography	875
175. Index	880
176. Summary	885
177. Acknowledgements	890
178. References	895
179. Appendix	900
180. Bibliography	905
181. Index	910
182. Summary	915
183. Acknowledgements	920
184. References	925
185. Appendix	930
186. Bibliography	935
187. Index	940
188. Summary	945
189. Acknowledgements	950
190. References	955
191. Appendix	960
192. Bibliography	965
193. Index	970
194. Summary	975
195. Acknowledgements	980
196. References	985
197. Appendix	990
198. Bibliography	995
199. Index	1000
200. Summary	1005

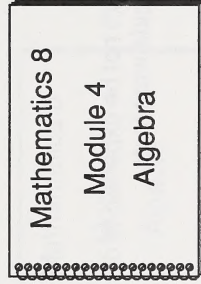
MODULE INTRODUCTION

What Lies Ahead

In the Module Introduction you will preview the module and learn how the module will be evaluated.

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students that the goal is to preview the module.
- Discuss the learning process, time management, and evaluation with the students. See the following suggestions.

The Learning Process

Each section of Module 4 deals with a different skill involving algebra.

Sections have several activities.

- Introductory Activities
- Practice Activities
- Extra Practice
- Concluding Activities

Remind the students that they will not be expected to do all the activities. You will help them decide what to do.

Time Management

Decide how long the student will need to complete the module. (The average student should spend about 7 weeks in a 40-week year to complete the module. It is recommended that students spend no more than 1 hour at a time doing mathematics.)

Evaluation

Explain that the grade on Module 4 is based on work in the assignment booklet. The module booklet will help prepare students for the assignment booklet.

GETTING SET

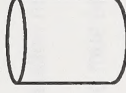
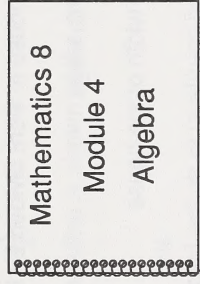
What Lies Ahead

This section will pretest the following skills.

- using variables in an algebraic expression
- evaluating expressions for a given value of the variable
- simplifying algebraic expressions by combining like terms
- using variables to write mathematical expressions and sentences
- solving equations using additive inverses
- solving equations using multiplicative inverses
- solving equations using additive and multiplicative inverses
- generating a set of ordered pairs
- plotting ordered pairs
- producing a graph
- describing relations

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students that the goal of this section is to discover their strengths and weaknesses.
- Help the students check their answers to the pretest. It is not necessary to correct any errors at this time. See the last page of this section for further directions.

Pretest

1. Translate each English phrase into a mathematical expression.
 - a. five times Sam's age
 - b. Helen's mass decreased by two kilograms
 - c. the distance from John's house to work divided by two
 - d. ten dollars more than Ruth's wage
 - e. the sum of the length and width of the house
2. Use learning aids (cylinders and counters) to do the following.
 - a. Model x and evaluate if $x = -1$.
 - b. Model $-x$ and evaluate if $x = -1$.
 - c. Model $x + 2$ and evaluate if $x = -1$.
 - d. Model $x + y$ and evaluate if $x = -1$ and $y = +1$.
 - e. Model $x + xy$ and evaluate if $x = -1$ and $y = +1$.

Suggested Answers

1.
 - a. $5 \times a$ or $5a$
 - b. $m - 2$
 - c. $d \div 2$ or $\frac{d}{2}$
 - d. $w + 10$
 - e. $l + w$
2. Modelling is shown at the end of this section.
 - a. -1
 - b. $+1$
 - c. $+1$
 - d. 0
 - e. -2

3. Use paper and pencil methods to evaluate the following expressions.

a. $2a + 7$ if $a = 3$

b. $n^2 - 2$ if $n = -5$

c. $e - 3d$ if $d = 2$ and $e = -2$

d. $3y + z$ if $y = \frac{1}{3}$ and $z = \frac{1}{2}$

4. Use learning aids (cylinders and counters) to model and simplify the following expressions.

a. $t + t + t + t$

b. $s + 2 - 3 + 1$

c. $a + 2 + a - 5$

d. $a + b - 3 + a$

e. $b + c - 1 - b$

5. Use paper and pencil methods to simplify the following expressions.

a. $3f - 1 + 2 - f$

b. $2a + 3ab + a - b$

c. $-cd + 3c^2 + cd - d$

d. $2a - 2 + 5a$

3. a. 13

b. 23

c. -8

d. $1\frac{1}{2}$

4. Modelling is shown at the end of this section.

a. $4t$

b. s

c. $2a - 3$

d. $2 + b - 3$

e. $c - 1$

5. a. $2f + 1$

b. $3a + 3ab - b$

c. $3c^2 - d$

d. $7a - 2$

6. Translate the following sentences into equations.
- Two times a number plus three results in thirteen.
 - Linton's age is six less than Evon's.
 - Katsuta's mass increased by 10 kg is the same as Hayanu's.
 - The length of the building squared is five less than the width of the building.
7. Model the following equations. Then solve the equations using inspection or guess-check-revise methods. Verify the solutions.
- $x + 2 = 8$
 - $3d = 12$
 - $2m - 1 = 7$
 - $5n = 2n - 9$
 - $2y + 3 = y - 1$
6. a. $2n + 3 = 13$
b. $e - 6 = \ell$
c. $k + 10 = h$
d. $\ell^2 = w - 5$
7. Modelling is shown at the end of this section.
- $x = +6$
 - $d = +4$
 - $m = +4$
 - $n = -3$
 - $y = -4$

8. Solve the following equations using inspection or guess-check-revise methods. Verify using paper and pencil methods.

a. $3w + 2 = 11$

b. $5x + 1 = 3x - 9$

9. Solve $x + 3 = 8$ using additive inverses. Verify the solution.

a. Use models.

b. Use paper and pencil methods.

10. Solve $3y = -12$ using multiplicative inverses. Verify the solution.

a. Use models.

b. Use paper and pencil methods.

11. Solve the following using paper and pencil methods. Verify the solutions.

a. $\frac{z}{3} = 5$

b. $\frac{a}{2} = \frac{7}{8}$

12. Solve $3d + 5 = 11$ using inverses. Verify the solution.

a. Use models.

b. Use paper and pencil methods.

8. a. $w = 3$

b. $x = -5$

9. a. Modelling is shown at the end of this section.

b.
$$\begin{array}{r} x + 3 = 8 \\ - 3 = -3 \\ \hline x = 5 \end{array}$$

10. a. Modelling is shown at the end of this section.

b.
$$\begin{array}{r} 3y = -12 \\ \frac{1}{3} \times 3y = \frac{1}{3} \times (-12) \\ y = -4 \end{array}$$

11. a. $r = 15$

b. $n = 1\frac{3}{4}$

12. a. Modelling is shown at the end of this section.

b.
$$\begin{array}{r} 3d + 5 = 11 \\ - 5 = -5 \\ \hline 3d = 6 \end{array}$$

$$\frac{1}{3} \times 3d = \frac{1}{3} \times 6$$

$$d = 2$$

13. Complete the following table of values.

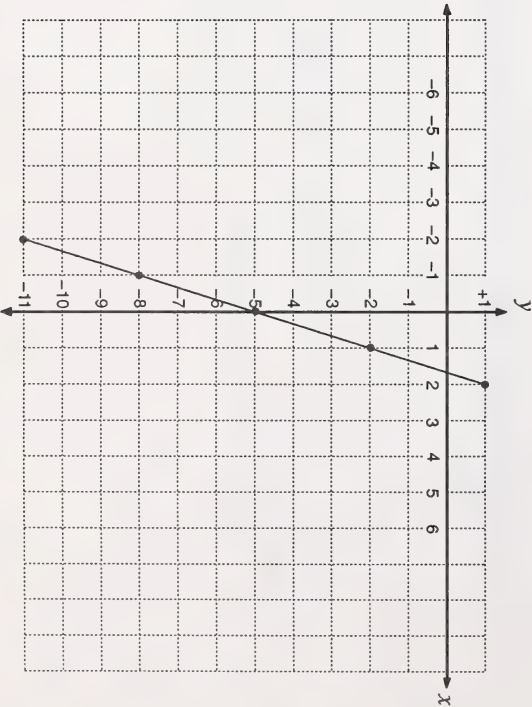
$y = 3x - 5$	
x	y
-2	
-1	
0	
1	
2	

13.

$y = 3x - 5$	
x	y
-2	-11
-1	-8
0	-5
1	-2
2	1

14. Graph $y = 3x - 5$.

14.



15. Jerrit unpacks cans from boxes at a grocery store.

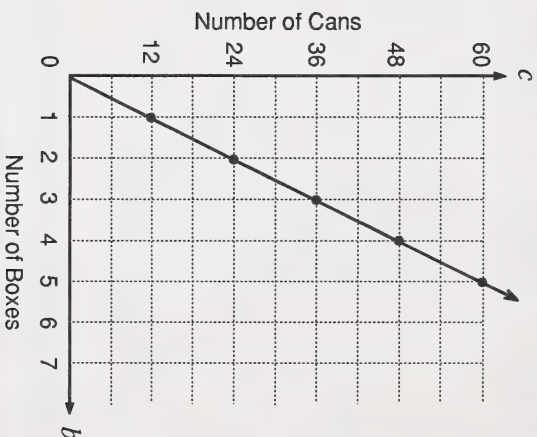
Number of Boxes (<i>b</i>)	Relation	Number of Cans (<i>c</i>)
1	12×1	12
2	12×2	24
3	12×3	36
4	12×4	48
5	12×5	60

15. a. The number of cans is twelve times the number of boxes.
- b. $c = 12b$
- c. $(1, 12), (2, 24), (3, 36), (4, 48), (5, 60), \dots$

- a. Use words to describe the relationship.
- b. Write an equation to describe the relationship.
- c. Use ordered pairs to describe the relationship.

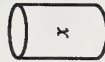
d. Use a graph to describe the relationship.

d.

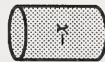


Modelling

2. a. Model
- x
- .

Evaluate if $x = -1$.The value of the expression is -1 .

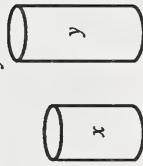
- b. Model
- $-x$
- .

Evaluate if $x = -1$. $-x$ is opposite of x .The value of the expression is $+1$.

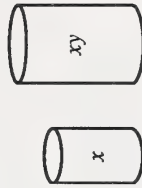
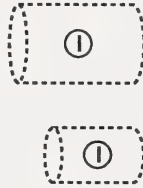
- c. Model
- $x + 2$
- .

Evaluate if $x = -1$.The value of the expression is $+1$.

- d. Model
- $x + y$
- .

Evaluate if $x = -1$ and $y = +1$.The value of the expression is 0 .

- e. Model
- $x + xy$
- .

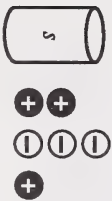
Evaluate if $x = -1$ and $y = +1$.If $x = -1$ and $y = +1$, $xy = (-1) \times (+1)$ or -1 .The value of the expression is -2 .

4. a. Model $t + t + t + t$.



This expression can be called $4t$.

- b. Model $s + 2 - 3 + 1$



Remove the zero pairs.



This expression is s .

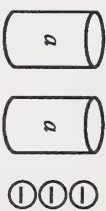
- c. Model $a + 2 + a - 5$.



Group the cylinders labelled a .

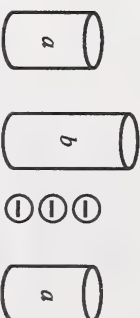


Remove the zero pairs.

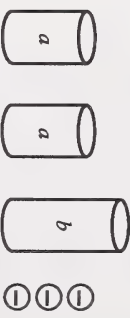


This expression is $2a - 3$.

- d. Model $a + b - 3 + a$.

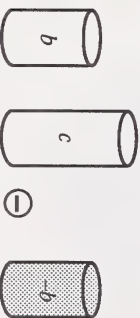


Group the cylinders labelled a .

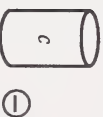


This expression is $2a + b - 3$.

- e. Model $b + c - 1 - b$.



Remove the zero pairs.



The expression is $c - 1$.

7. a. Model $x + 2 = 8$.

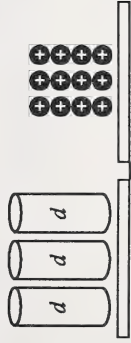


Verify $x = +6$.



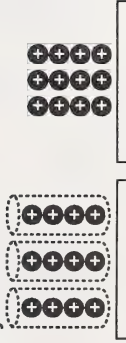
LS = RS

- b. Model $3d = 12$.



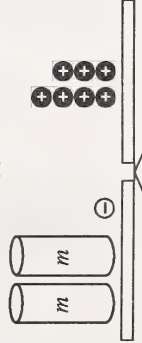
LS = RS

Verify $d = +4$.

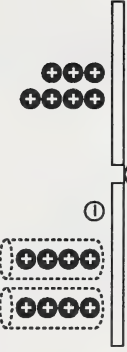


LS = RS

- c. Model $2m - 1 = 7$.

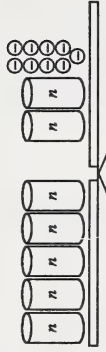


Verify $m = +4$.

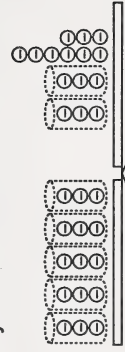


LS = RS

- d. Model $5n = 2n - 9$.



Verify $n = -3$.

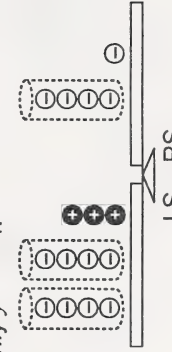


LS = RS

- e. Model $2y + 3 = y - 1$.

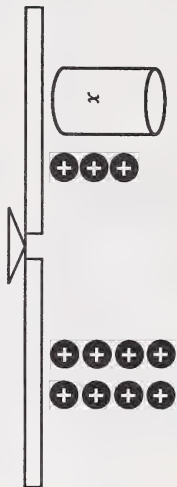


Verify $y = -4$.



LS = RS

9. a. Model $x + 3 = 8$.



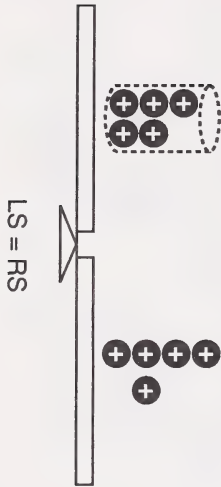
Add -3 to both sides.



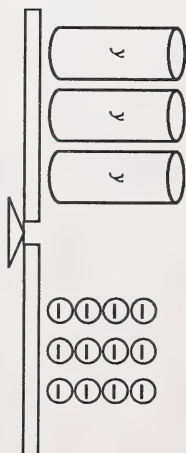
Remove the zero pairs.



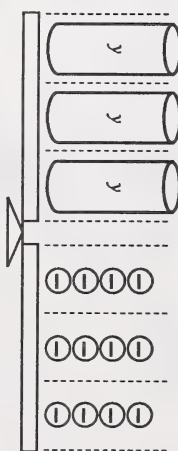
Verify $x = +5$.



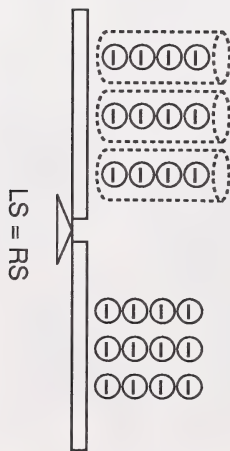
10. a. Model $3y = -12$.



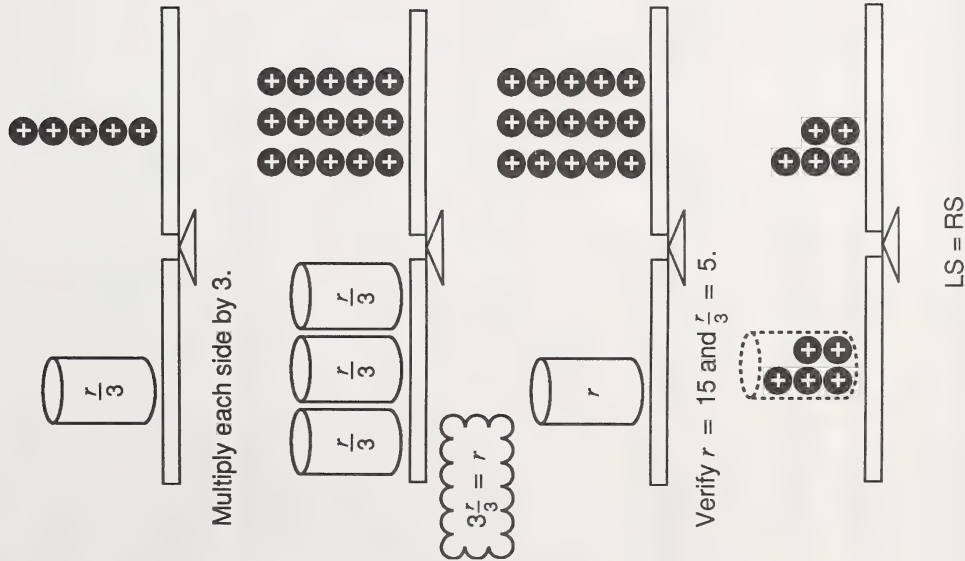
Divide each side into 3 groups.



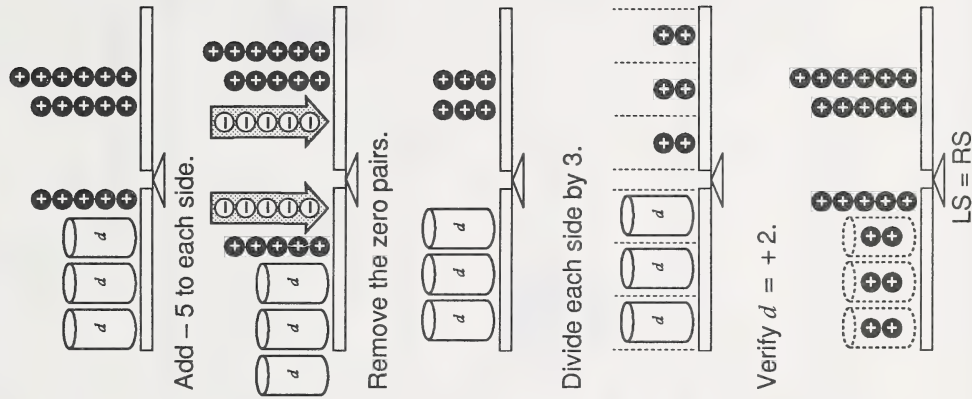
Verify $y = -4$.



11. a. Model $\frac{r}{3} = 5$.



12. a. Model $3d + 5 = 11$.



TRANSLATING WORDS AND PHRASES

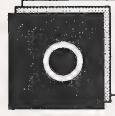
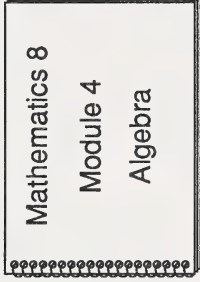
What Lies Ahead

In this section the student will learn these skills.

- translating English phrases into mathematical expressions
- interpreting the meaning of variables and algebraic expressions

Gathering Materials

For this section the student will need these items.



*BRITANNICA: Problem Solving in
Algebra*

(optional)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

Translate each English phrase into a mathematical expression

1. seven baseballs increased by nine baseballs
2. the difference between nine poodles and six poodles
3. five groups of fifteen children
4. forty-eight pizzas divided by sixteen people
5. three more than the difference of five years and two years
6. thirty-two tapes decreased by eight groups of three tapes

Suggested Answers

1. $7 + 9$
2. $9 - 6$
3. 5×15
4. $48 \div 16$
5. $3 + 5 - 2$
6. $32 - 8 \times 3$

Practice Activities

1. Translate the following English expressions into mathematical expressions containing variables.

- a. the sum of a number and three
- b. three subtracted from a number
- c. two thirds of a number
- d. a number squared
- e. five more than a number
- f. twice a number increased by six
- g. one less than two thirds of a number
- h. four more than one half of a number
- i. the difference between eight and a number cubed

Suggested Answers

1. a. $n + 3$
- b. $n - 3$
- c. $\frac{2}{3}n$
- d. n^2
- e. $n + 5$
- f. $2n + 6$
- g. $\frac{2}{3}n - 1$
- h. $\frac{1}{2}n + 4$
- i. $8 - n^3$

Print Alternative



2. Translate the following situations into mathematical phrases.
- | | |
|--|-------------------|
| a. Marco's age increased by two years | 2. a. $a + 2$ |
| b. twice the distance from Muriel's house to school | b. $2d$ |
| c. a number squared | c. n^2 |
| d. five times the price of a car | d. $5p$ |
| e. twice Amar's salary plus three dollars | e. $2s + 3$ |
| f. one half of the price | f. $\frac{1}{2}p$ |
| g. a boy's age twelve years from now | g. $a + 12$ |
| h. the sum of Ardit's mass and twenty-five kilograms | h. $m + 25$ |

Computer Alternative

3. Do Introductory Lesson 1 of *BRITANNICA: Problem Solving in Algebra*.
3. Computer corrected

Concluding Activities

1. Read the following phrases aloud.
 - a. three times four, less two
 - b. three times, four less two
 - c. the sum of two, and five times three
 - d. the sum of two and five, times three
2. How did you translate the commas when you read the phrases in Question 1?
3. Mathematicians sometimes use brackets to show order of operations. Translate the expressions in Question 1 into mathematical expressions containing brackets.

Suggested Answers

2. The commas were translated as pauses.
3.
 - a. $(3 \times 4) - 2$
 - b. $3 \times (4 - 2)$
 - c. $2 + (5 \times 3)$
 - d. $3 \times (2 + 5)$

4. Translate the following English expressions into algebraic expressions.

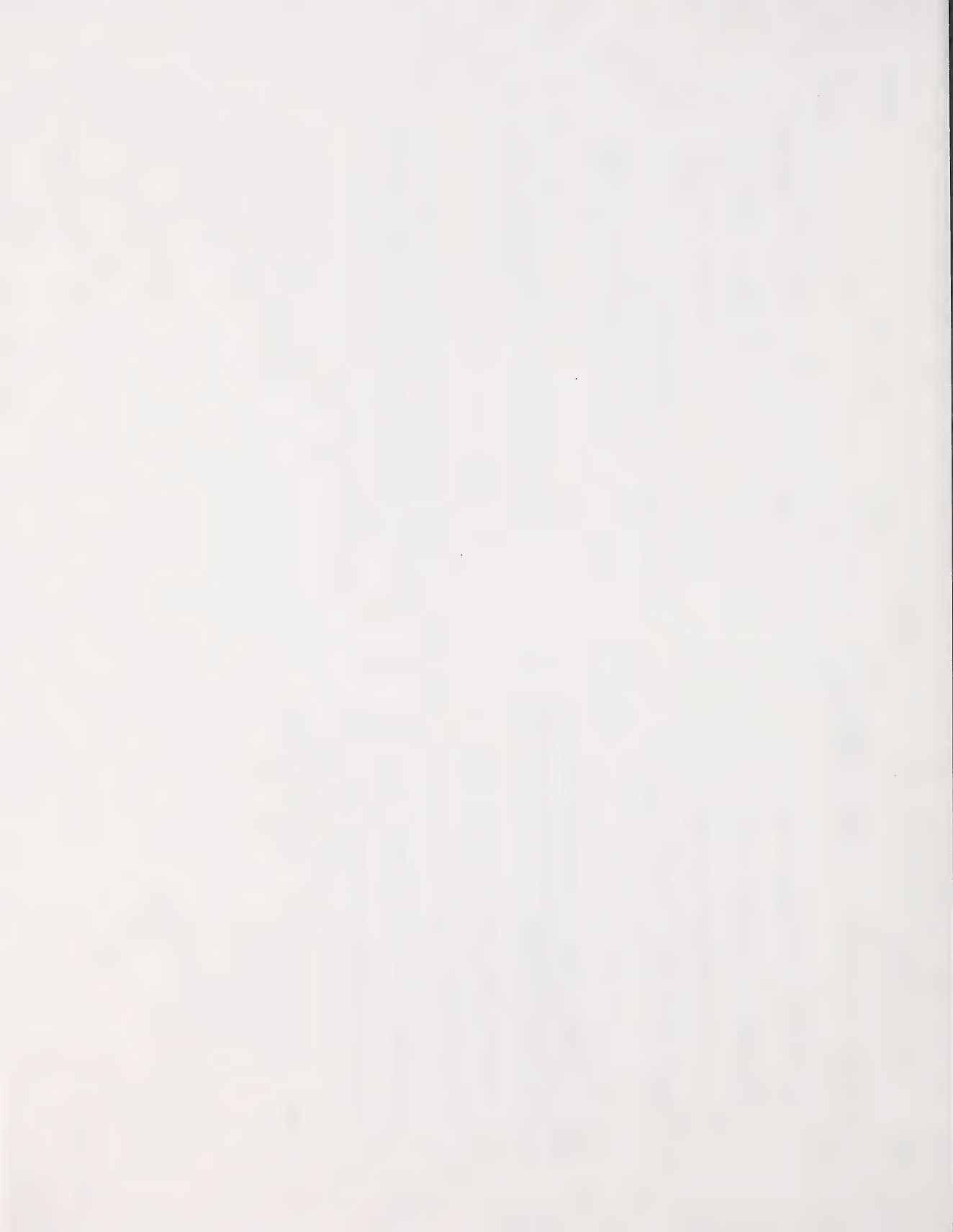
- a. sixteen times, two more than a number
- b. sixteen times two, more than a number
- c. four times the length, plus eight centimetres
- d. four times, the length plus eight centimetres

4. a. $16(2 + n)$
 b. $(16 \times 2) + n$
 c. $4\ell + 8$
 d. $4(\ell + 8)$ or $4 \times (\ell + 8)$

5. Remember that subtraction is sometimes translated in a different order. Translate the following English expressions into mathematical expressions.

- a. the difference of three, and two times a number
- b. the difference of three and two, times a number
- c. four less than three, times a number
- d. four less than, three times a number

5. a. $3 - 2n$
 b. $(3 - 2)n$ or $(3 - 2) \times n$
 c. $(3 - 4)n$ or $(3 - 4) \times n$
 d. $3n - 4$



EVALUATING ALGEBRAIC EXPRESSIONS

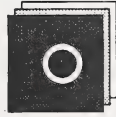
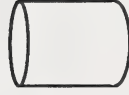
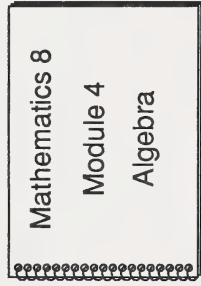
What Lies Ahead

In this section the student will learn these skills.

- modelling algebraic expressions
- evaluating algebraic expressions using models
- evaluating algebraic expressions using paper and pencil methods

Gathering Materials

For this section the student will need these items.



*Computer Drill and Instruction:
Mathematics, Level D (SRA)*

(optional)




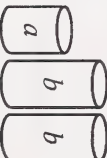
Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

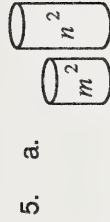
Introductory Activities

1.
 - a. Model $x + 5$.
 - b. Evaluate $x + 5$ if $x = +3$.
 - c. Evaluate $x + 5$ if $x = -2$.
2.
 - a. Model $3 - y$.
 - b. Evaluate $3 - y$ if $y = +4$.
 - c. Evaluate $3 - y$ if $y = -1$.
3.
 - a. Model $3z - 5$.
 - b. Evaluate $3z - 5$ if $z = -2$.
 - c. Evaluate $3z - 5$ if $z = +3$.
4.
 - a. Model $a + 2b$.
 - b. Evaluate $a + 2b$ if $a = -1$ and $b = +3$.
 - c. Evaluate $a + 2b$ if $a = +2$ and $b = -2$.

Suggested Answers

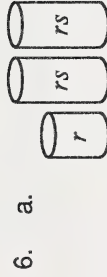
1.
 - a. 
 - b. $+8$
 - c. $+3$
2.
 - a. 
 - b. -1
 - c. $+4$
3.
 - a. 
 - b. -11
 - c. $+4$
4.
 - a. 
 - b. $+5$
 - c. -2

5. a. Model $m^2 + n^2$.
 b. Evaluate $m^2 + n^2$ if $m = +2$ and $n = +3$.
 c. Evaluate $m^2 + n^2$ if $m = -1$ and $n = 0$.
6. a. Model $r + 2rs$.
 b. Evaluate $r + 2rs$ if $r = -1$ and $s = +2$.
 c. Evaluate $r + 2rs$ if $r = +3$ and $s = -1$.
7. a. Model $3(a - 5)$.
 b. Evaluate $3(a - 5)$ if $a = +1$.
 c. Evaluate $3(a - 5)$ if $a = -1$.



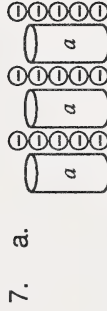
b. $+13$

c. $+1$



b. -5

c. -3



b. $+12$

c. -18

Practice Activities**Computer Alternative**

1. Do Lesson 5 of the *Pre-Algebra* disk from the package *Computer Drill and Instruction: Mathematics, Level D* (SRA).

Remember, if you need help, press the SHIFT key and the ? key.

Suggested Answers

1. Computer corrected

Print Alternative

2. a. Evaluate $n + 10$ if $n = 8$.

2. a. 18

- b. Evaluate $2p$ if $p = 0.6$.

- b. 1.2

- c. Evaluate $5r - 2$ if $r = \frac{3}{5}$.

- c. 1

d. Evaluate $3 + 4s$ if $s = 0.5$.

d. 5

e. Evaluate $2n^2 + 1$ if $n = 4$.

e. 33

f. Evaluate $0.5n - 0.1$ if $n = 2$.

f. 0.9

Concluding Activities

1. Complete the following tables. Evaluate the first three values and then use a pattern to help you find the last three values.

a.

a	$a + 2$
1	
2	
3	
4	
5	
6	

b.

b	$4b - 1$
1	
2	
3	
4	
5	
6	

Suggested Answers

a.

a	$a + 2$	Pattern
1	3	+1
2	4	+1
3	5	+1
4	6	+1
5	7	+1
6	8	+1

b.

b	$4b - 1$	Pattern
1	3	+4
2	7	+4
3	11	+4
4	15	+4
5	19	+4
6	23	+4

c.

c	$2c$
1	
2	
3	
4	
5	
6	

c.

c	$2c$	Pattern
1	2	+ 2
2	4	+ 2
3	6	+ 2
4	8	+ 2
5	10	+ 2
6	12	+ 2

d.

d	$3d + 2$
1	
2	
3	
4	
5	
6	

d.



d	$3d + 2$	Pattern
1	5	+ 3
2	8	+ 3
3	11	+ 3
4	14	+ 3
5	17	+ 3
6	20	+ 3

e.


f	$5f - 1$
1	
2	
3	
4	
5	
6	

2. How are the patterns in Question 1 similar to the algebraic expressions?

Hint: $a + 2 = 1a + 2$.

3. Each of the following algebraic expressions has a missing number shown by . Use the table of values to find each value of .

a.


k	 $k - 3$
1	1
2	5
3	9
4	13


e.

f	$5f - 1$	Pattern
1	4	+ 5
2	9	+ 5
3	14	+ 5
4	19	+ 5
5	24	+ 5
6	29	+ 5

2. In Question 1 the number in the pattern is also the numerical coefficient of the variable, or the number with which the variable is multiplied.

3. a.


k	 $k - 3$	Pattern
1	1	+ 4
2	5	+ 4
3	9	+ 4
4	13	+ 4

So, using the pattern,
 = 4.

y	$y + 1$
1	7
2	13
3	19
4	25

b.

y	$y + 1$	Pattern
1	7	+ 6
2	13	+ 6
3	19	+ 6
4	25	

So, using the pattern,
 = 6.

d	$d - 1$
1	1
2	3
3	5
4	7

c.

d	$d - 1$	Pattern
1	1	+ 2
2	3	+ 2
3	5	+ 2
4	7	

So, using the pattern,
 = 2.

x	$x + 4$
1	7
2	10
3	13
4	16

d.

x	$x + 4$	Pattern
1	7	+ 3
2	10	+ 3
3	13	+ 3
4	16	

So, using the pattern,
 = 3.

4. Complete the following tables. Evaluate the first three variables and then use a pattern to help you find the last three values.

a.

a	a^2
1	
2	
3	
4	
5	
6	

4. a.

a	a^2
1	1
2	4
3	9
4	16
5	25
6	36

$\left. \begin{array}{c} +3 \\ +5 \\ +7 \\ +9 \\ +11 \end{array} \right\}$ $\left. \begin{array}{c} +2 \\ +2 \\ +2 \\ +2 \\ +2 \end{array} \right\}$

b.

b	$b^2 + 3$
1	
2	
3	
4	
5	
6	

b.

b	$b^2 + 3$
1	4
2	7
3	12
4	19
5	28
6	39

$\left. \begin{array}{c} +3 \\ +5 \\ +7 \\ +9 \\ +11 \end{array} \right\}$ $\left. \begin{array}{c} +2 \\ +2 \\ +2 \\ +2 \\ +2 \end{array} \right\}$

c.

c	$c^2 - 1$
1	
2	
3	
4	
5	
6	

c.

c	$c^2 - 1$	Pattern
1	0	
2	3	+3
3	8	+5
4	15	+7
5	24	+9
6	35	+11

5. Complete the following statements.

- In Question 1 the exponent of each variable is _____, and you found the difference _____ to obtain the pattern. Hint: $a + 2 = a + 2$ and $4b - 1 = 4b - 1$.
- In Question 4 the exponent of each variable is _____, and you found the difference _____ to obtain the pattern.

- In Question 1 the exponent of each variable is 1, and you found the difference once to obtain the pattern.
- In Question 4 the exponent of each variable is 2, and you found the difference twice to obtain the pattern.

6. Each of the following algebraic expressions has the exponent of the variable missing. Use the table of values to find the missing exponent.

a.

a	$a^{\text{■}} + 1$
1	2
2	5
3	10
4	17

6. a.

a	$a^{\text{■}} + 1$	Pattern
1	2	
2	5	$\left. \begin{array}{c} +3 \\ +2 \end{array} \right\}$
3	10	$\left. \begin{array}{c} +5 \\ +2 \end{array} \right\}$
4	17	$\left. \begin{array}{c} +7 \\ +2 \end{array} \right\}$

The difference was found twice, so $\text{■} = 2$ and $a^{\text{■}} + 1 = a^2 + 1$.

b.

b	$b^{\text{■}} - 1$
1	0
2	1
3	2
4	3

b.

b	$b^{\text{■}} - 1$	Pattern
1	0	
2	1	$\left. \begin{array}{c} +1 \end{array} \right\}$
3	2	$\left. \begin{array}{c} +1 \end{array} \right\}$
4	3	$\left. \begin{array}{c} +1 \end{array} \right\}$

The difference was found once, so $\text{■} = 1$ and $b^{\text{■}} - 1 = b^1 - 1$, or $b - 1$.

SIMPLIFYING ALGEBRAIC EXPRESSIONS

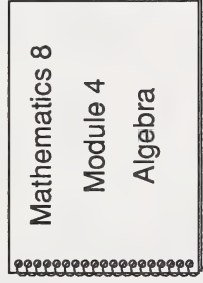
What Lies Ahead

In this section the student will learn these skills.

- identifying like terms and unlike terms
- simplifying algebraic expressions using models
- simplifying algebraic expressions using paper and pencil methods

Gathering Materials

For this section the student will need these items.



(optional)

*Computer Drill and Instruction:
Mathematics, Level D (SRA)*

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

Use models to simplify the following expressions.

1. $m + m$

2. $d + 2 + d - 4$

3. $y + y + 3 + x + 1 + x - 6 + x$

4. $a + y + a - 3$

5. $-4 + n + n + 7 - 6 + n$

6. $j + 3 + j + 3 + j + 3$

Suggested Activities

See the models on the following pages.

1. $2m$

2. $2d - 2$

3. $2y + 3x - 2$

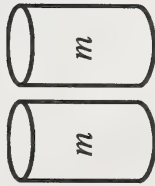
4. $2a + y - 3$

5. $3n - 3$

6. $3j + 9$

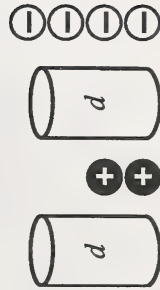
Modelling

1. Model
- $m + m$
- .



$$\text{So, } m + m = 2m.$$

2. Model
- $d + 2 + d - 4$
- .



Reroup.

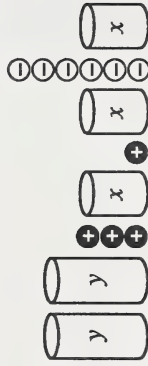


Remove the zero pairs.

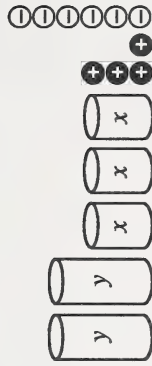


$$\text{So, } d + 2 + d - 4 = 2d - 2.$$

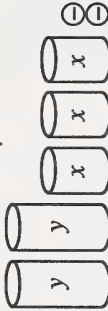
3. Model
- $y + y + 3 + x + 1 + x - 6 + x$
- .



Reroup.

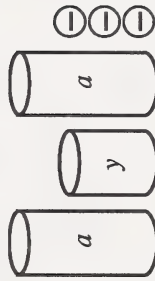


Remove the zero pairs.

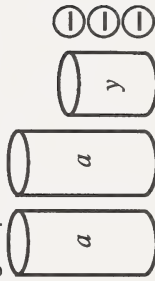


$$\text{So, } y + y + 3 + x + 1 + x - 6 + x = 2y + 3x - 2.$$

4. Model
- $a + y + a - 3$
- .

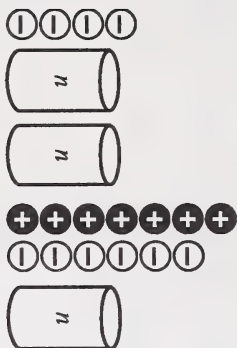


Reroup.

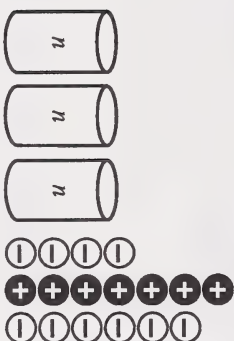


$$\text{So, } a + y + a - 3 = 2a + y - 3.$$

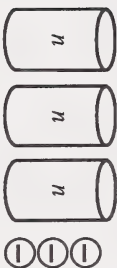
5. Model $-4 + n + n + 7 - 6 + n$.



Regroup.



Remove the zero pairs.

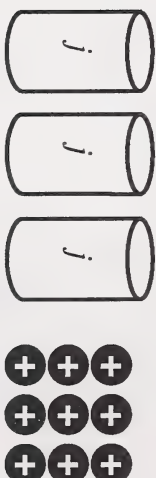


So, $-4 + n + n + 7 - 6 + n = 3n - 3$.

6. Model $j + 3 + j + 3 + j + 3$.



Regroup.



So, $j + 3 + j + 3 + j + 3 = 3j + 9$.

Practice Activities

Computer Alternative



1. Do Lesson 9 of the *Pre-Algebra* disk from the package *Computer Drill and Instruction: Mathematics, Level D* (SRA).

Suggested Answers

1. Computer corrected

Print Alternative

2. Simplify by collecting the like terms



- | | |
|-------------------------------------|-------------------------|
| a. $2f + 5f$ | 2. a. $7f$ |
| b. $5x - 2x + 4z - 2z$ | b. $3x + 2z$ |
| c. $3a - 2a^2 - 5a$ | c. $-2a^2 - 2a$ |
| d. $3m - 2 + 4p + 7m + 7n - 13$ | d. $10m + 7n + 4p - 15$ |
| e. $2a + 3b + 2ab + 5b - 8ab$ | e. $2a - 6ab + 8b$ |
| f. $-6cd + 3c^2 + 2d^2 + cd + 4d^2$ | f. $3c^2 - 5cd + 6d^2$ |

Extra Practice

1. Use the words **like** and **unlike** to describe each of the following pairs.

a. $3x$ and x

b. $4y$ and $4x$

c. $-2a^2$ and a

d. 8 and $\frac{1}{5}$

2. Simplify the following expressions.

a. $6 + 4p - 3 - 6p$

b. $3a - a^2 + 5a - 4a^2$

c. $6a - 4ab + ab - 7a + 8a$

d. $-4p + 6n - 3n + 7p - 6p + 5n$

e. $4w - 7 + 3x + 5w + 13x - wx$

Suggested Answers

1. a. like

b. unlike

c. unlike

d. like

2. a. $-2p + 3$

b. $-5a^2 + 8a$

c. $7a - 3ab$

d. $8n - 3p$

e. $9w + 16x - wx - 7$

Concluding Activities

1. Which of the following expressions are equivalent?

a. $a^2 - b^2 + 2b^2 - a^2$

b. $2a^2 + 3a - 2a^2$

c. $3a - b + a + 2b$

d. $-3b + 3a + 4b - 2a$

e. $2a - b - a + 2b$

f. $6a - 8 + 3a + 5$

g. $3a + a + 4b - 3b$

h. $2ab - b^2 - 2ab + 2b^2$

i. $4a + 2b - a - 2b$

j. $a^2 + a - a^2 + 2a$

Suggested Answers

1. Expressions a. and h. are equivalent.
 Expressions b., i., and j. are equivalent.
 Expressions c. and g. are equivalent.
 Expressions d. and e. are equivalent.

The expressions can each be simplified as shown:

a. $1b^2$

b. $3a$

c. $4a + b$

d. $a + b$

e. $a + b$

f. $9a - 3$

g. $4a + b$

h. b^2

i. $3a$

j. $3a$

2. Evaluate the following.

a. $2m + 6m$, if $m = 2$

b. $5q - 2q$, if $q = 2.7$

c. $5t - 3t + 2t$, if $t = \frac{1}{4}$

d. $3f - g - f + g$, if $f = 2$ and $g = 5$

2. a. 16

b. 8.1

c. 1

d. 4

3. Collect the like terms in Question 2. Then evaluate the simplified expressions.

3. a. $8m, 16$

b. $3q, 8.1$

c. $4t, 1$

d. $2f, 4$

4. What do you notice about the answers in Questions 2 and 3?

4. The answers in Questions 2 and 3 are the same. In other words, you can evaluate before or after simplifying an expression.

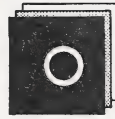
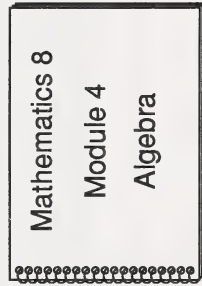
TRANSLATING SENTENCES

What Lies Ahead

- In this section the student will learn this skill.
- translating English sentences into equations

Gathering Materials

For this section the student will need these items.



(optional)

*BRITANNICA: Problem Solving in
Algebra*

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities**Print Alternative**

1. Write each of the following sentences as an equation.
 - a. Twelve decreased by a number is four.
 - b. The sum of the number and one half of the number is equal to forty-eight.
 - c. A number tripled decreased by 2 results in -7 .
 - d. Three kilograms more than Bob's mass is fifty-two kilograms.
 - e. Five dollars more than double Marnie's money is \$79.
 - f. Nine less than half the total number of newspapers delivered is twenty-seven newspapers.

Suggested Answers

1.
 - a. $12 - n = 4$
 - b. $n + \frac{1}{2}n = 48$
 - c. $3n - 2 = -7$
 - d. $3 + m = 52$
 - e. $2m + 5 = 79$
 - f. $\frac{1}{2}n - 9 = 27$

Computer Alternative

2. Do Introductory Lessons 5 and 6 of *BRITANNICA: Problem Solving in Algebra*.

2. Computer corrected

Practice Activities

Write an equation for each of these problems.

1. Six times a number plus ten equals forty. What is the number?
2. A number increased by two and a half equals seven. What is the number?
3. The price of six hockey tickets plus eight dollars for refreshments equals eighty dollars. How much did each hockey ticket cost?
4. Chandia used an average of six sheets of loose-leaf paper each day. At the end of the semester she had used six hundred fifty-four sheets of paper. How many days long was the semester?
5. Zaib now has thirty-seven tropical fish in his aquarium. This is seven less than four times the number of fish that he had when he started his aquarium. How many tropical fish did Zaib have at the start?

Suggested Answers

1. $6n + 10 = 40, n = 5$
2. $n + 2\frac{1}{2} = 7, n = 4\frac{1}{2}$
3. $6n + 8 = 80, n = 12$
4. $6n = 654, n = 109$
5. $4n - 7 = 37, n = 11$

Concluding Activities

Translate the following. Use brackets where needed.

1. The square of nine, minus three, results in seventy-eight.
2. The square of, nine minus three, gives thirty-six.
3. The sum of eight and two, times a number is sixty.
4. The sum of eight, and two times a number equals twenty.

Suggested Answers

1. $9^2 - 3 = 78$
2. $(9 - 3)^2 = 36$
3. $n \times (8 + 2) = 60$, $(8 + 2) \times n = 60$, $n(8 + 2) = 60$,
or $(8 + 2)n = 60$.
4. $2n + 8 = 20$

EQUATIONS

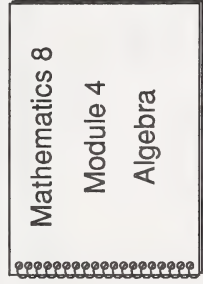
What Lies Ahead

In this section the student will learn these skills.

- modelling equations
- solving equations by inspection or by using guess-check-revise methods
- verifying solutions by modelling the equation

Gathering Materials

For this section the student will need these items.



*MATH MOVES: Equations—Solving
With One Step (ACCESS)*

(optional)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

1. a. Model $a + 4 = 5$.
 b. Solve the equation by inspection. (Find the value that makes the equation true.)
 c. Verify the solution. (Check to see if the equation is true for this value of the variable.)
2. a. Model $b - 2 = -5$.
 b. Solve the equation by inspection.
 c. Verify the solution.
3. a. Model $2c = -6$.
 b. Solve the equation by inspection.
 c. Verify the solution.
4. a. Model $3d = 9$.
 b. Solve the equation by inspection.
 c. Verify the solution.

Suggested Activities

Modelling and verifying is shown on pages 53 to 55.

1. b. By inspection you can see that $a = 1$.
2. b. By inspection you can see that $b = -3$.
3. b. By inspection you can see that $c = -3$.
4. b. By inspection you can see that $d = 3$.

5. a. Model $2m + 1 = 7$.
b. Solve the equation by inspection.
c. Verify the solution.
6. a. Model $3x - 1 = 2$.
b. Solve the equation by inspection.
c. Verify the solution.
7. a. Model $3x - 8 = 16$.
b. Solve the equation by using the guess-check- revise method.
c. Verify the solution.
8. a. Model $4x = 2x + 6$.
b. Solve the equation by using the guess-check- revise method.
c. Verify the solution.
5. b. By inspection you can see that $m = +3$.
6. b. By inspection you can see that $x = +1$.
7. b. By using the guess-check-reverse method, you will find that $x = 8$.
8. b. By using the guess-check-reverse method, you will find that $x = 3$.

9. a. Model $8 + 3x = 7x$.
b. Solve the equation by using the guess-check-revise method.
c. Verify the solution.
10. a. Model $4(n + 3) = 20$.
b. Solve the equation by using the guess-check-revise method.
c. Verify the solution.
11. a. Model $2x - 3 = 2 + 3x$.
b. Solve the equation by using the guess-check-revise method.
c. Verify the solution.
9. b. By the guess-check-revise method $x = 2$.
10. b. By the guess-check-revise method $n = 2$.
11. b. By the guess-check-revise method $x = -5$.

Modelling

1. a. Model $a + 4 = 5$.



- c. Verify $a = 1$.



LS = RS

2. a. Model $b - 2 = -5$.

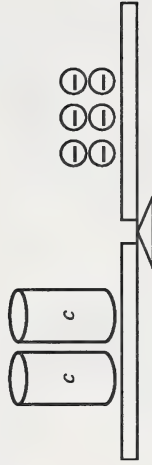


- c. Verify $b = -3$.

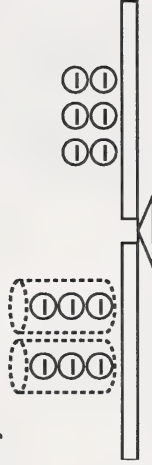


LS = RS

3. a. Model $2c = -6$.



- c. Verify $c = -3$.



LS = RS

4. a. Model $3d = 9$.



- c. Verify $d = 3$.

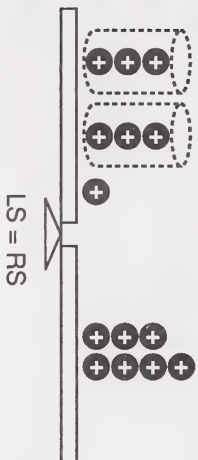


LS = RS

5. a. Model $2m + 1 = 7$.



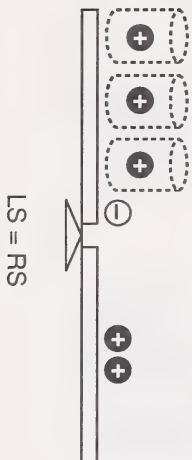
- c. Verify $m = 3$.



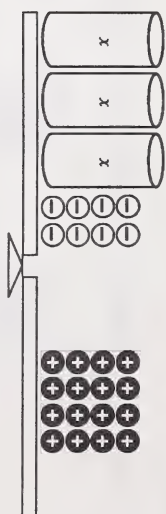
6. a. Model $3x - 1 = 2$.



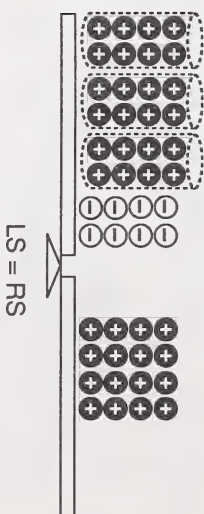
- c. Verify $x = +1$.



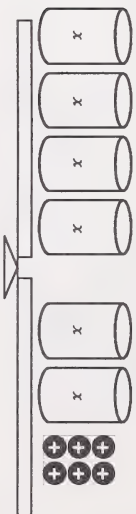
7. a. Model $3x - 8 = 16$.



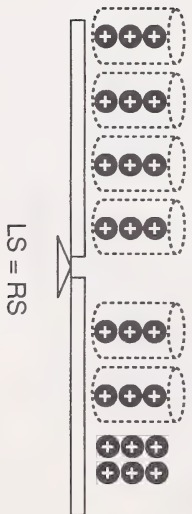
- c. Verify $x = +8$.



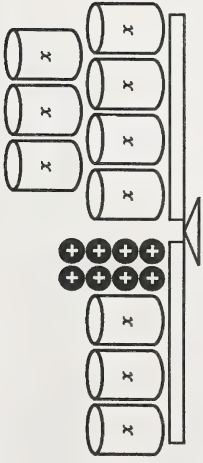
8. a. Model $4x = 2x + 6$.



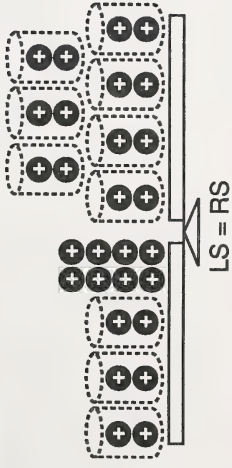
- c. Verify $x = 3$.



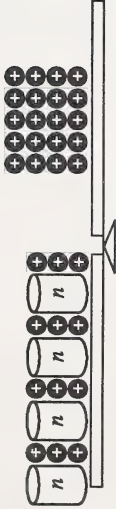
9. a. Model $8 + 3x = 7x$.



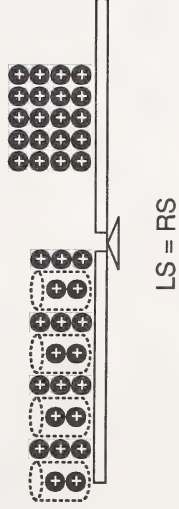
- c. Verify $x = 2$.



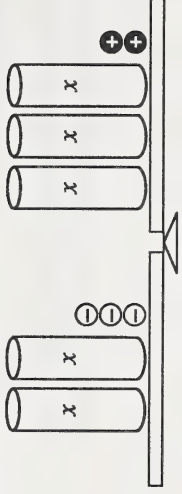
10. a. Model $4(n + 3) = 20$.



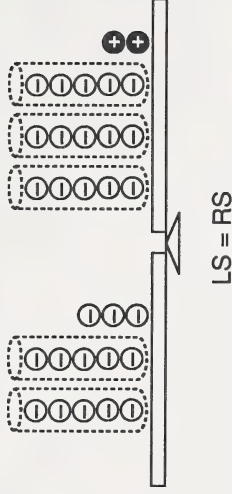
- c. Verify $n = 2$.



11. a. Model $2x - 3 = 2 + 3x$.



- c. Verify $x = -5$.



Practice Activities

Solve the following equations by using inspection or guess-check-revise methods. Do not use models.

1. $n + 8 = 12$

2. $p - 5 = -5$

3. $4b = -4$

4. $6 + x = 3$

5. $3w + 8 = 5$

6. $4t - 1 = 7$

7. $5x + 4 = 4x + 10$

8. $2(a - 7) = 4$

Suggested Answers

1. $n = 4$

2. $p = 0$

3. $b = -1$

4. $x = -3$

5. $w = -1$

6. $t = 2$

7. $x = 6$

8. $a = 9$

Concluding Activities

Solve the following equations by using inspection or guess-check-revise methods. Do not use models.

1. $\frac{a}{3} = 5$

2. $\frac{b}{4} = 20$

3. $\frac{30}{c} = 6$

4. $\frac{r}{15} = \frac{1}{5}$

5. $\frac{10}{t} = \frac{2}{3}$

Suggested Answers

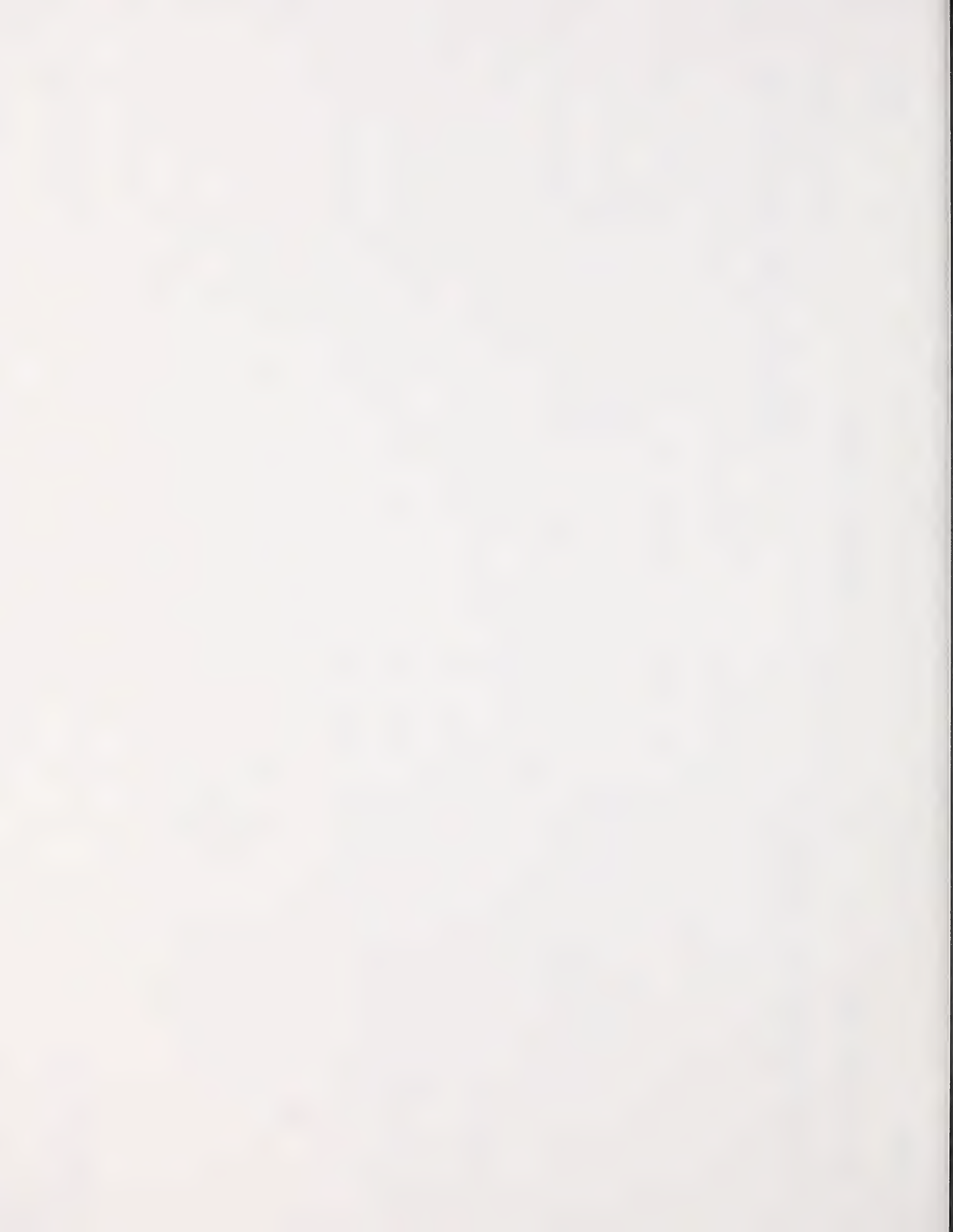
1. $a = 15$

2. $b = 80$

3. $c = 5$

4. $r = 3$

5. $t = 15$



SOLVING EQUATIONS USING ADDITIVE INVERSES

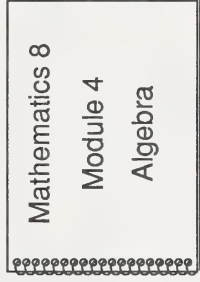
What Lies Ahead

In this section the student will learn these skills.

- using learning aids and additive inverses to solve equations
- using a paper and pencil method and additive inverses to solve equations

Gathering Materials

For this section the student will need these items.



*MATH MOVES: Equations—Solving
With One Step (ACCESS)*

(optional)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

Model these equations and solve the equations by isolating the variable. Be sure to verify your solutions.

1. $n + 7 = 9$

2. $b - 2 = 6$

3. $y - 1 = 1$

4. $q - 4 = -7$

5. $7 = m - 5$

Suggested Answers

Modelling and verifying is shown on the next page.

1. $n = +2$

2. $b = +8$

3. $y = +2$

4. $q = -3$

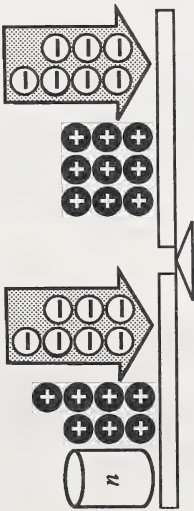
5. $m = +12$

Modelling

1. Model $n + 7 = 9$.



Add -7 to each side.



Remove the zero pairs.

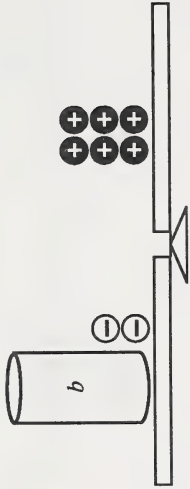


Verify $n = +2$.



LS = RS

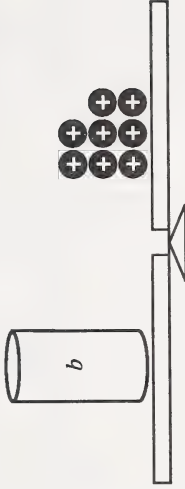
2. Model $b - 2 = 6$.



Add $+2$ to each side.



Remove the zero pairs.



Verify $b = +8$.

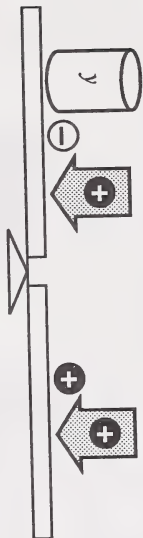


LS = RS

3. Model $y - 1 = 1$.



Add +1 to each side.



Remove the zero pairs.

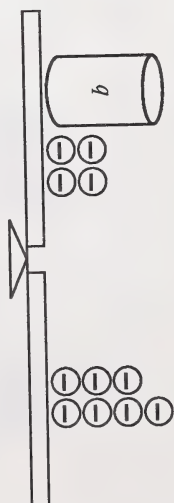


Verify $y = +2$.

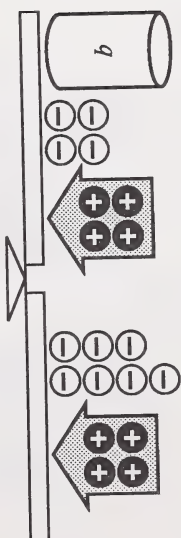


$$LS = RS$$

4. Model $q - 4 = -7$.



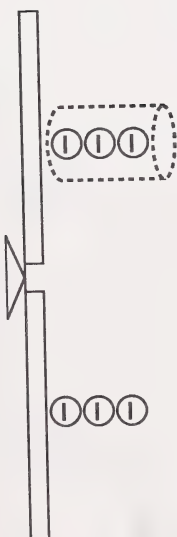
Add +4 to each side.



Remove the zero pairs.

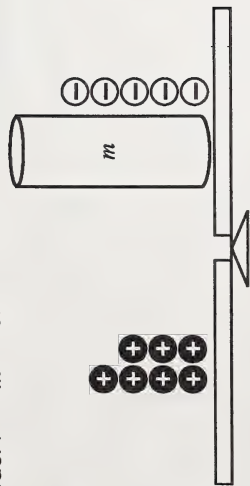


Verify $q = -3$.

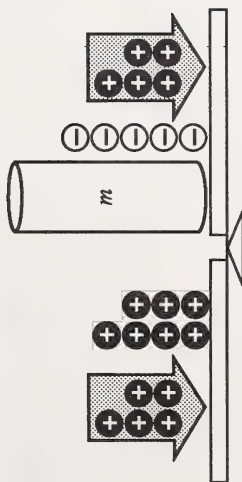


$$LS = RS$$

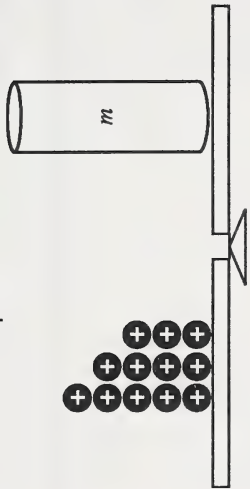
5. Model $7 = m - 5$.



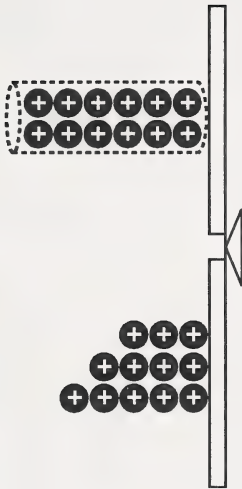
Add +5 to each side.



Remove the zero pairs.



Verify $m = 12$.



$LS = RS$

Practice Activities

1. What numbers should be added to both sides to isolate the variable?

a. $x + 2 = 7$

b. $s + 4 = 9$

c. $m + 9 = -13$

d. $t - 5 = 7$

e. $y - 2 = -8$

2. Solve the equations in Question 1 using paper and pencil methods. Verify your solutions.

Suggested Answers

1. a. -2

b. -4

c. -9

d. $+5$

e. $+2$

2. a. $x = 5$

b. $s = 5$

c. $m = 4$

d. $t = 12$

e. $y = -6$

Extra Practice

Use flow charts and inverse flow charts to solve these equations.

1. $s - 3 = 5$

2. $k + 12 = 39$

3. $2 + m = 8$

4. $s - 4 = 3$

Suggested Answers

1. $s = 8$

2. $k = 27$

3. $m = 6$

4. $s = 7$

Concluding Activities

Solve these equations using a paper and pencil method. Verify your solutions.

1. $x + 225 = 5$

2. $n - 8.5 = 12.3$

3. $q - \frac{1}{2} = \frac{3}{4}$

4. $p + 7.5 = 8.2$

5. $m - 5\frac{3}{4} = 3\frac{1}{4}$

6. $s - 383 = 117$

Suggested Answers

1. $x = -220$

2. $n = 20.8$

3. $q = 1\frac{1}{4}$

4. $p = 0.7$

5. $m = 9$

6. $s = 500$

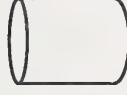
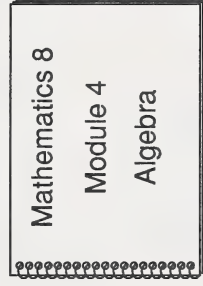
SOLVING EQUATIONS USING MULTIPLICATIVE INVERSES

What Lies Ahead

- In this section the student will learn these skills.
- using learning aids and multiplicative inverses to solve equations
 - using paper and pencil methods and multiplicative inverses to solve equations

Gathering Materials

For this section the student will need these items.



(optional)

*MATH MOVES: Equations — Solving
With One Step (ACCESS)*

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

Model these equations and solve the equations by isolating the variable. Be sure to verify your solutions.

1. $2y = 6$

2. $2x = 6$

3. $2t = -2$

4. $3w = 12$

5. $10 = 5t$

Suggested Answers

Modelling is shown on the next page.

1. $y = 3$

2. $x = 3$

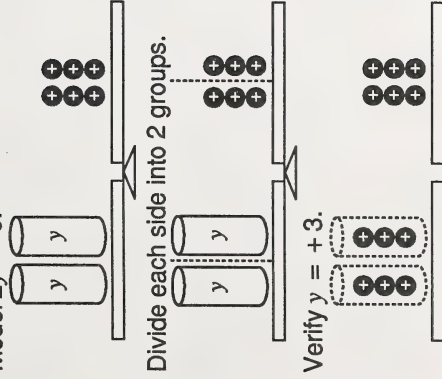
3. $t = -1$

4. $w = 4$

5. $t = 2$

Modelling

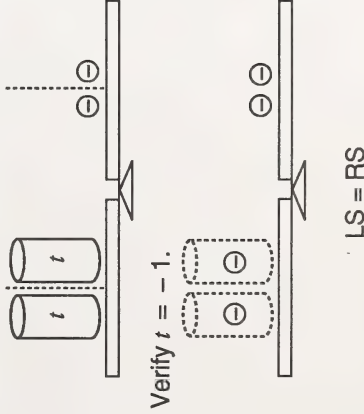
1. Model
- $2y = 6$
- .



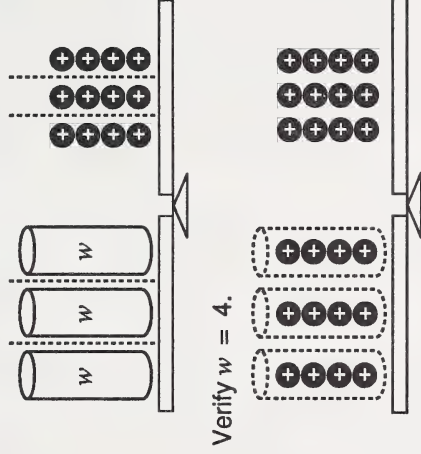
2. Model
- $2x = 6$
- the same way as you did
- $2y = 6$
- in

Question 1.

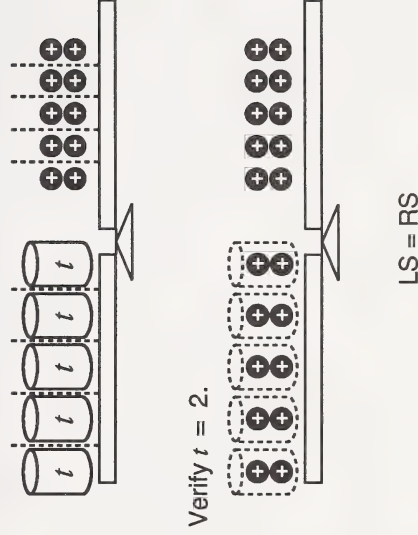
3. Model
- $2t = -2$
- and divide each side into 2 groups.



4. Model
- $3w = 12$
- and divide each side into 3 groups.



5. Model
- $10 = 5r$
- and divide each side into 5 groups.



Practice Activities

1. What number should both sides be divided by to isolate the variable?

a. $2y = 18$

b. $4v = 32$

c. $3m = -9$

d. $-2f = -4$

e. $5y = -10$

Suggested Answers

1. a. 2

b. 4

c. 3

d. -2

e. 5

2. Solve the equations in Question 1 by using paper and pencil methods. Verify your solutions.

2. a. $y = 9$

b. $v = 8$

c. $m = -3$

d. $f = 2$

e. $y = -2$

Extra Practice

Use flow charts and inverse flow charts to solve these equations.

1. $9t = -72$

2. $3t = 30$

3. $44 = 4n$

4. $-10 = 2w$

Suggested Answers

1. $t = -8$

2. $t = 10$

3. $n = 11$

4. $w = -5$

Concluding Activities

Solve the equations using a paper and pencil method. Verify the solutions.

1. $4t = 6$

2. $3a = \frac{1}{2}$

3. $2r = \frac{3}{4}$

4. $2p = 14.4$

5. $3m = 0.9$

Suggested Answers

1. $t = 1\frac{1}{2}$

2. $a = \frac{1}{6}$

3. $r = \frac{3}{8}$

4. $p = 7.2$

5. $m = 0.3$

SOLVING MORE EQUATIONS USING MULTIPLICATIVE INVERSES

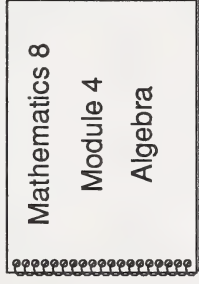
What Lies Ahead

In this section the student will learn these skills.

- using learning aids and multiplicative inverses to solve more equations
- using paper and pencil methods and multiplicative inverses to solve more equations
- using clearing-denominator methods and cross-product methods to solve equations

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

1. Solve the following equations by using models. Be sure to verify each solution.

a. $\frac{n}{5} = 6$

b. $\frac{d}{11} = 3$

c. $\frac{t}{2} = -12$

d. $\frac{p}{8} = 2$

e. $\frac{b}{7} = -1$

2. Solve the equations in Question 1 using paper and pencil methods.

Suggested Answers

1. Modelling and verifying is shown on the next page.

a. $n = 30$

b. $q = 33$

c. $r = -24$

d. $p = 16$

e. $b = -7$

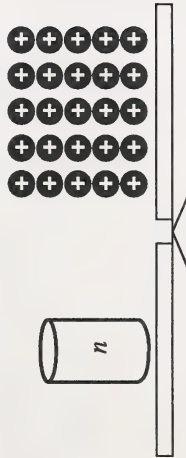
2. The answers will be the same as those found in Question 1.

Modelling

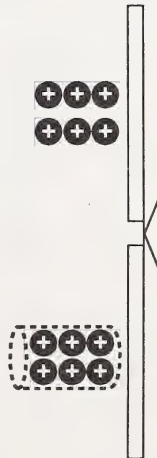
a. Model $\frac{n}{5} = 6$.



Multiply each side by 5, and replace five $\frac{n}{5}$ with n .



Verify $n = 30$ and $\frac{n}{5} = 6$.



LS = RS

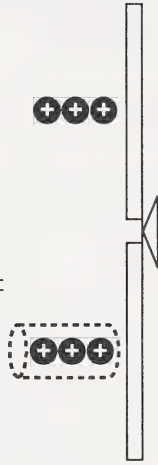
b. Model $\frac{q}{11} = 3$.



Multiply each side by 11.

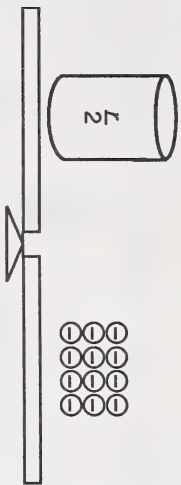


Verify $q = 33$ and $\frac{q}{11} = 3$.

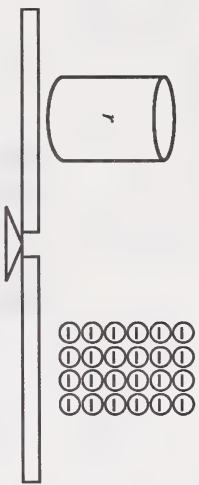


LS = RS

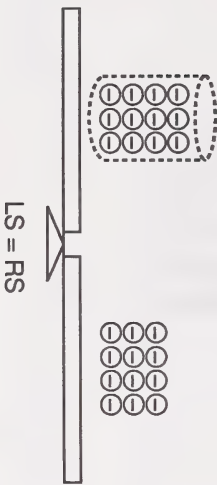
c. Model $\frac{r}{2} = -12$.



Multiply each side by 2, and replace two $\frac{r}{2}$ with r .



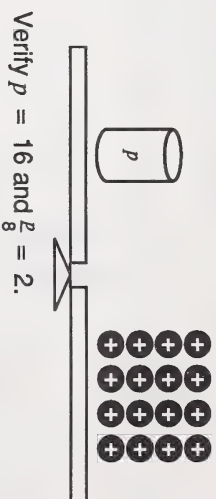
Verify $r = -24$ and $\frac{r}{2} = -12$.



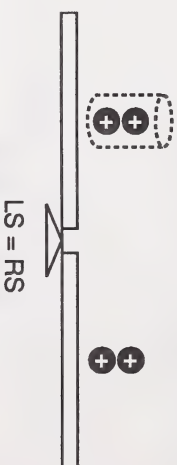
d. Model $\frac{p}{8} = 2$.



Multiply each side by 8, and replace eight $\frac{p}{8}$ by p .



Verify $p = 16$ and $\frac{p}{8} = 2$.



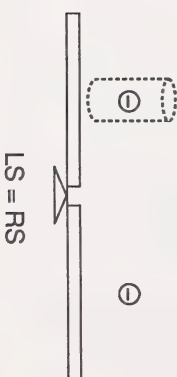
e. Model $\frac{b}{7} = -1$.



Multiply each side by 7, and replace seven $\frac{b}{7}$ with b .



Verify $b = -7$ and $\frac{b}{7} = -1$.



Practice Activities

1. What number should both sides of the equation be multiplied by to isolate the variable?

a. $\frac{n}{15} = \frac{2}{3}$

b. $\frac{f}{9} = \frac{8}{3}$

c. $\frac{y}{5} = \frac{30}{36}$

d. $\frac{r}{7} = \frac{5}{8}$

e. $\frac{3}{4} = \frac{c}{20}$

2. Solve the equations in Question 1. Verify your solutions.

Suggested Answers

1. a. 15

b. 9

c. 5

d. 7

e. 20

2. a. $n = 10$

b. $f = 24$

c. $y = 4\frac{1}{6}$

d. $r = 4\frac{3}{8}$

e. $c = 15$

Extra Practice

Use flow charts and inverse flow charts to solve these equations.

1. $\frac{2}{3} = 2$

2. $\frac{b}{4} = 16$

3. $\frac{c}{2} = \frac{3}{4}$

4. $\frac{d}{5} = \frac{8}{25}$

Suggested Answers

1. $a = 6$

2. $b = 64$

3. $c = 1\frac{1}{2}$

4. $c = 1\frac{3}{5}$

Concluding Activities

Solve the following equations by clearing the denominators or by using cross products. Be sure to verify your solutions.

1. $\frac{h}{7} = \frac{5}{2}$

2. $\frac{5}{t} = \frac{9}{8}$

3. $\frac{n}{2} = \frac{1}{4}$

4. $\frac{4}{m} = \frac{1}{3}$

5. $\frac{w}{6} = \frac{1}{3}$

Suggested Answers

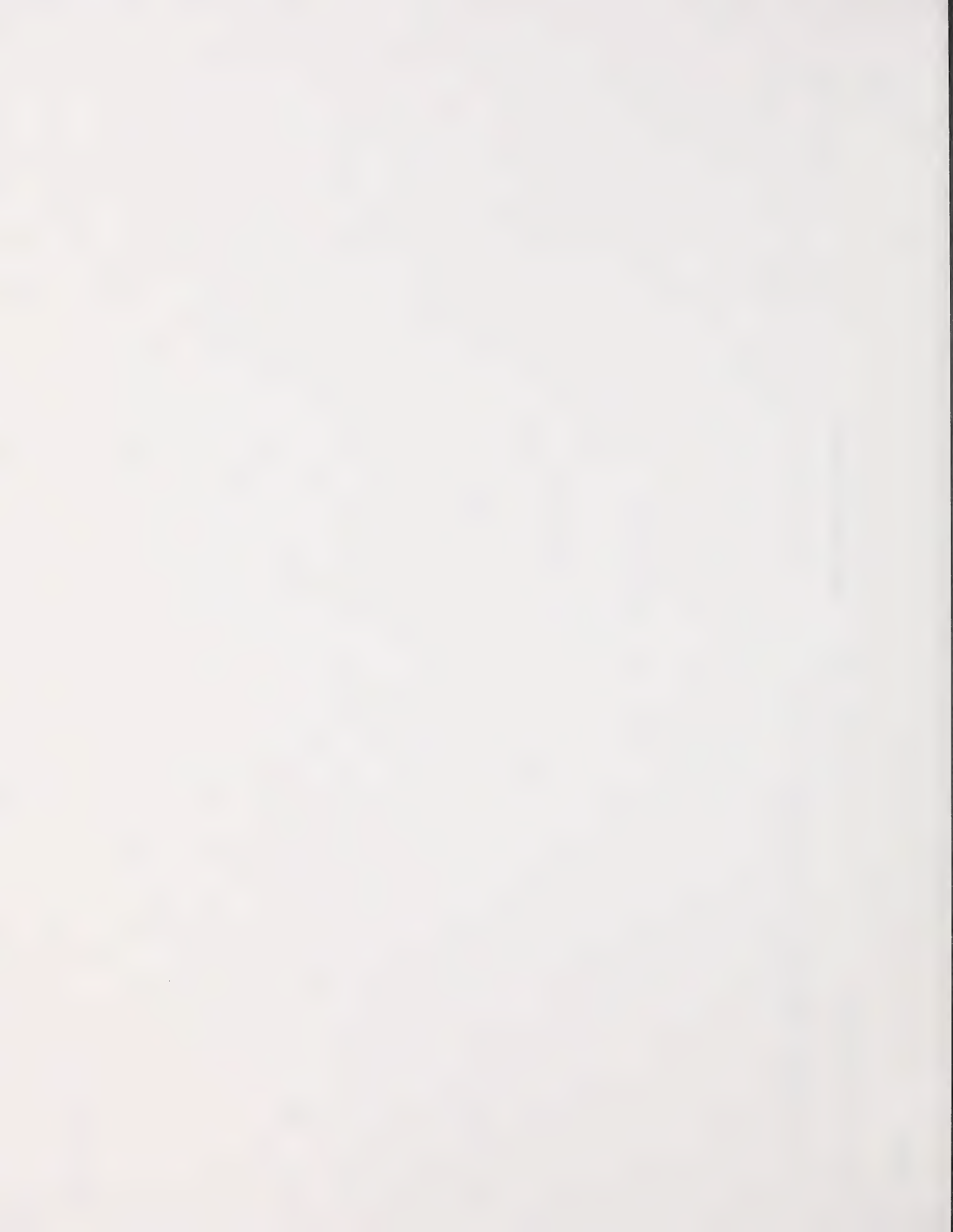
1. $h = 17\frac{1}{2}$

2. $t = 4\frac{4}{9}$

3. $n = \frac{1}{2}$

4. $m = 12$

5. $w = 2$



SOLVING EQUATIONS USING ADDITIVE AND MULTIPLICATIVE INVERSES

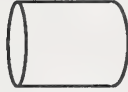
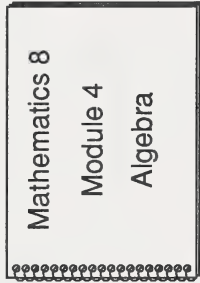
What Lies Ahead

In this section the student will learn these skills.

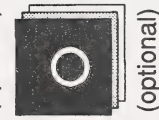
- solving more complex equations using learning aids
- solving more complex equations using a procedure with paper and pencil

Gathering Materials

For this section the student will need these items.



*MATH MOVES: Equations—Solving
With More Than One Step (ACCESS)*



*Computer Drill and Instruction:
Mathematics, Level D (SRA)*

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

Model these equations by isolating the variable. Be sure to verify your solutions.

1. $3q - 3 = 6$

2. $3y + 4 = 13$

3. $2b + 6 = 12$

4. $p + 3p = 8$

5. $5k - 2k = 6$

Suggested Answers

Modelling is shown on the next page.

1. $q = +3$

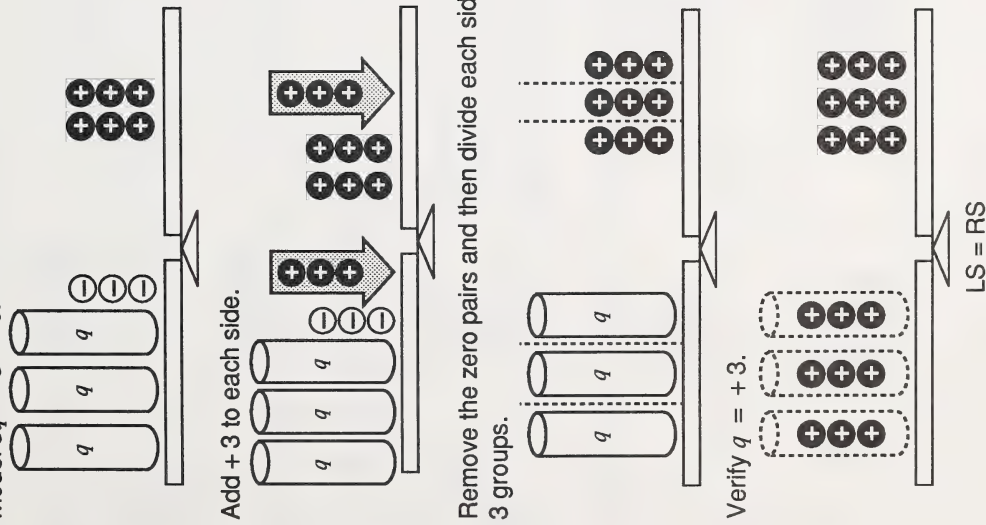
2. $y = +3$

3. $b = +3$

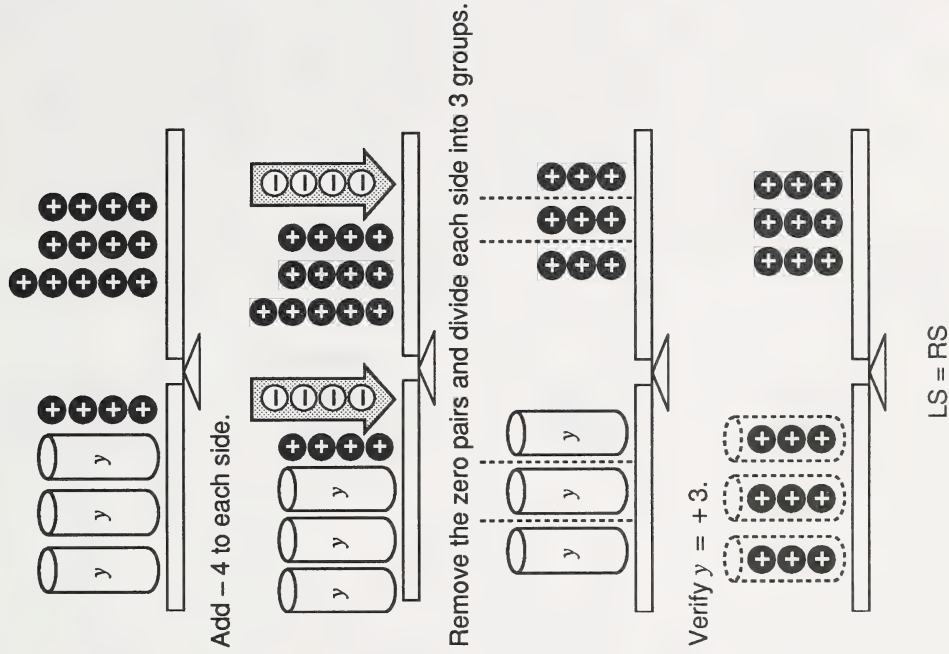
4. $p = +2$

5. $k = +2$

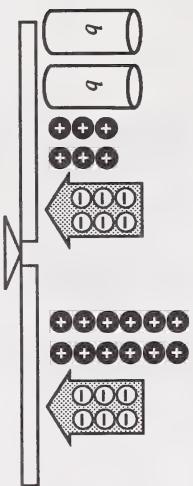
1. Model $3q - 3 = 6$.



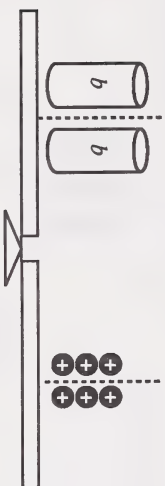
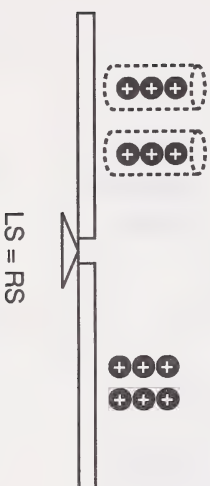
2. Model $3y + 4 = 13$.



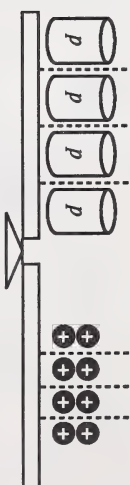
3. Model
- $2b + 6 = 12$
- .

Add -6 to each side.

Remove the zero pairs and divide each side into 2 groups.

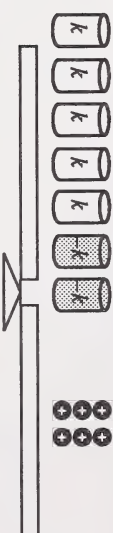
Verify $b = +3$.

4. Model
- $p + 3p = 8$
- and divide each side into 4 groups.

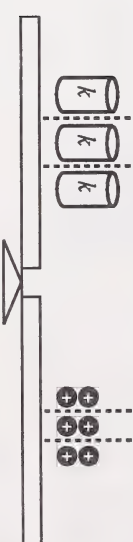
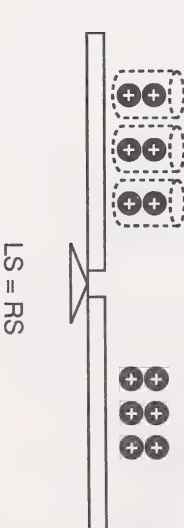
Verify $p = +2$.

LS = RS

5. Model
- $5k - 2k = 6$
- .



Remove the zero pairs and divide each side into 3 groups.

Verify $k = +2$ and $-k = -2$.

Practice Activities**Computer Alternative**

1. Do Lesson 8 and Lesson 10 on the disk *Pre-Algebra* from the package *Computer Drill and Instruction: Mathematics, Level D* (SRA).

Suggested Answers

1. Computer corrected

Print Alternative

2. Solve the equations by using a paper and pencil method. Be sure to verify your solutions.



- | | |
|-------------------|-------------|
| a. $5x + 6 = 31$ | a. $x = 5$ |
| b. $6x - 3 = 15$ | b. $x = 3$ |
| c. $8a + 6 = 22$ | c. $a = 2$ |
| d. $3c - 3 = -24$ | d. $c = -7$ |
| e. $11n + 44 = 0$ | e. $n = -4$ |

3. Solve the following conditions. Place the letter that goes with each condition below the solution in the boxes below.

A $8y - 5y = 30$

L $4a + 2a + 3a = 18$

V $3x + 5x - 2x = 36$

T $9b - 4b + 2b = 77$

E $10c + 4c - 6c = 64$

H $4m + 3m = 84$

O $8x + 2x - 2 = 28$

I $12y - 11y = 8 - 3$

M $-10a + 5a + 7 - 5 = -33$

5	4	2	3	6	8	9	7	10	11	12
I		L	O	V	E		M	A	T	H

3. $y = 10$

$a = 2$

$x = 6$

$b = 11$

$c = 8$

$m = 12$

$x = 3$

$y = 5$

$a = 7$

Extra Practice

Solve the following equations using flow charts and inverse flow charts. Use your calculator to help you if you wish.

1. $3a - 2 = 7$

2. $2b + 1 = -9$

3. $3c - 4 = 5$

4. $4b - 1 = -9$

5. $2d + 1 = 5$

Suggested Answers

1. $a = 3$

2. $b = -5$

3. $c = 3$

4. $b = -2$

5. $d = 2$

Concluding Activities

Solve the following equations by using additive and multiplicative inverses. Verify the solutions.

1. $2a + \frac{1}{2} = \frac{3}{4}$

2. $3b - 1 = 8.3$

3. $5c + 1.5 = -10$

4. $2.5 = 1 + 3d$

5. $t + 1 + 3t = 9$

Suggested Answers

1. $a = \frac{1}{8}$

2. $b = 3.1$

3. $c = 2.3$

4. $d = 0.5$

5. $t = 2$

EQUATIONS WITH TWO VARIABLES

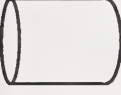
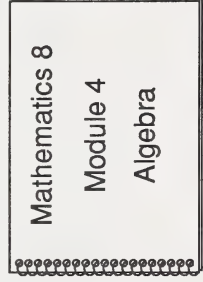
What Lies Ahead

In this section the student will learn these skills.

- modelling equations with two variables
- making a table of values for equations with two variables
- graphing equations

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

For each of the equations do the following.

- Use inspection or guess-check-revise methods to find three solutions.
- Write the solutions as ordered pairs.
- Verify the solutions with models.

1. $y = 3x$

Models are shown on the next page.

1. $(0, 0), (1, 3), (2, 6), (3, 9), (4, 12), \dots$

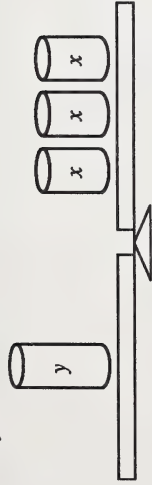
2. $y = x - 1$

2. $(0, -1), (1, 0), (2, 1), (3, 2), (4, 3), \dots$

3. $y = 2x + 1$

3. $(0, 1), (1, 3), (2, 5), (3, 7), (4, 9), \dots$

1. Model $y = 3x$.



Verify that the solution is $(0, 0)$.



LS = RS

Verify that the solution is $(1, 3)$.



LS = RS

The other ordered pairs are verified in a similar manner.

2. Model $y = x - 1$.



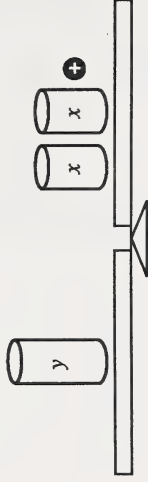
Verify that the solution is $(0, -1)$.



LS = RS

The other ordered pairs are verified in a similar manner.

3. Model $y = 2x + 1$.



Verify that the solution is $(0, 1)$.



LS = RS

The other ordered pairs are verified in a similar manner.

Practice Activities

1. Complete the following tables of values.

a.

$y = 2x$	
x	y
-3	
0	
3	
6	

b.

$y = 3x + 1$	
x	y
-8	
-4	
0	
4	

Suggested Answers

1.

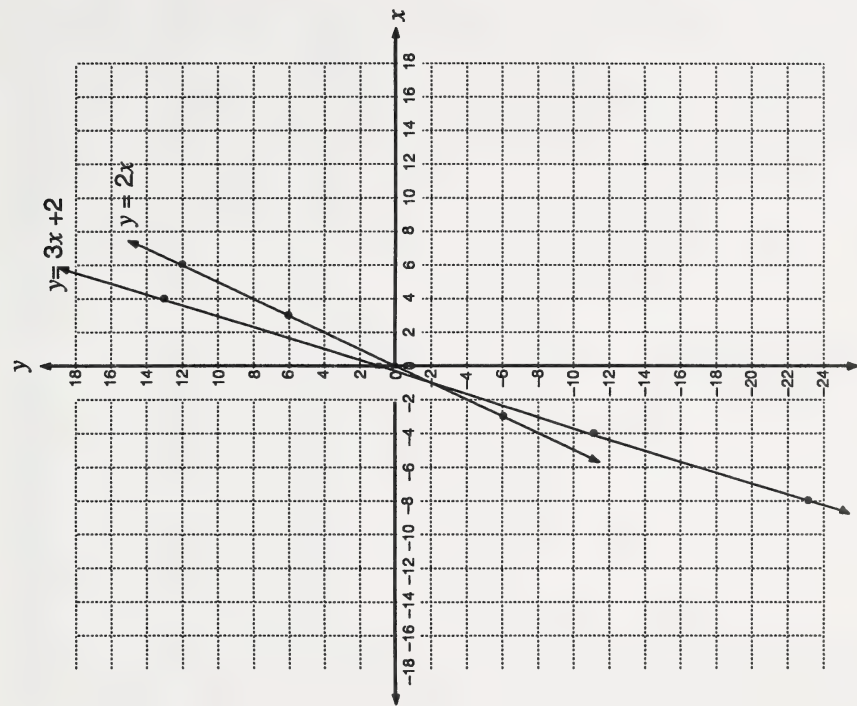
a.

$y = 2x$	
x	y
-3	-6
0	0
3	6
6	12

b.

$y = 3x + 1$	
x	y
-8	-23
-4	-11
0	1
4	13

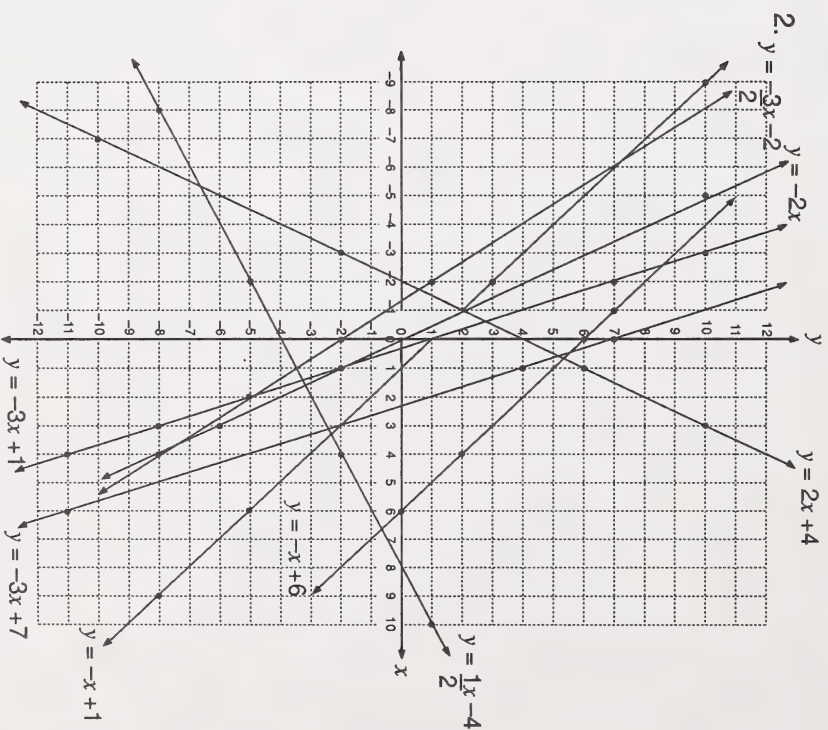
2. Graph the equations from Question 1.



Concluding Activities

- Find the answer to the riddle by completing the worksheet on the following page.¹
- Graph each of the equations from Question 1 on the grid at the right.
- What do you notice about the graphs of all the equations in Question 1?

Suggested Answers



3. All the graphs are of straight lines. The graphs of equations with positive coefficients slant from top right to bottom left. The graphs of equations with negative coefficients slant from top left to bottom right.

¹ 1982 Creative Publications, Sunnyvale, California 94086 for excerpt from *Algebra With Pizzazz*.

WHY DID ZORNA POUR KETCHUP ON HER BROTHER'S HAND?

Complete the table for each equation. Find each answer in the code key and notice the letter next to it. Write this letter in the box at the bottom of the page that contains the circled number in that row of the table.

$y = -2x$	
x	y
1	-2
4	-8
-5	10
3	-6

$y = 2x + 4$	
x	y
3	10
-7	-10
1	6
-3	-2

$y = -3x + 1$	
x	y
3	-8
-3	10
4	-11
-2	7

$y = \frac{1}{2}x - 4$	
x	y
10	1
-2	-5
4	-2
-8	-8

$y = -x + 6$	
x	y
4	2
-1	7
6	0
0	6

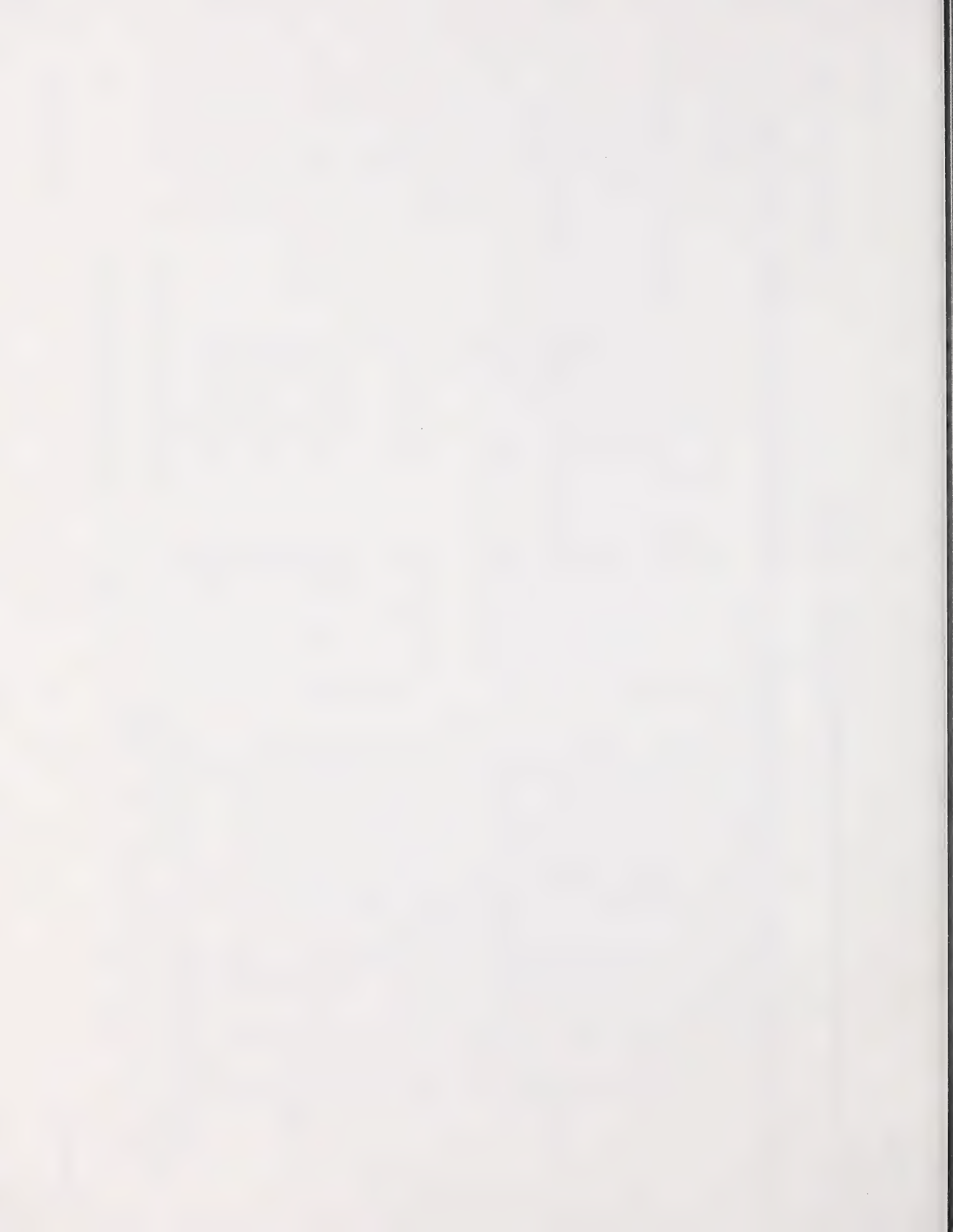
$y = -\frac{3}{2}x - 2$	
x	y
4	-8
2	-5
0	-2
-2	1

$y = -3x + 7$	
x	y
6	-11
1	4
0	7
-2	13

$y = -x + 1$	
x	y
-2	3
-9	10
9	-8
6	-5

CODE KEY	
13	L
10	R
7	A
6	T
4	P
3	M
2	W
1	I
0	N
-2	H
-5	D
-6	B
-8	E
-10	O
-11	S

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
H	E	R	B	R	O	T	H	E	R	S	A	I	D	H	E	W	A	N	T	E	D	H	I	S	P	A	L	M	R	E	D



RELATIONS

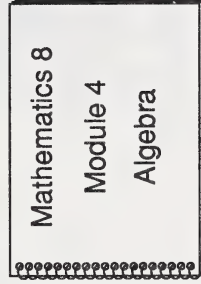
What Lies Ahead

In this section the student will learn these skills.

- describing a relation using a table, a rule, ordered pairs, and a graph
- finding missing terms in a sequence

Gathering Materials

For this section the student will need these items.



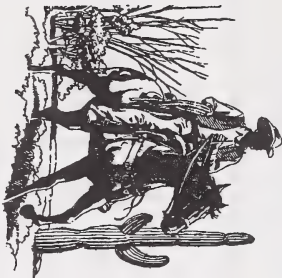
Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

- Help the students check their answers to the activities in this section and correct any errors.

Practice Activities

1. Santini likes to go horseback riding. How is the cost related to the riding time?



Riding Time In Hours (t)	Relation	Cost In Dollars (c)
1	$4 + 2 \times 1$	6
2	$4 + 2 \times 2$	8
3	$4 + 2 \times 3$	10
4	$4 + 2 \times 4$	12
5	$4 + 2 \times 5$	14

Describe the relationship by using each of the following methods.

- a. Write the words to describe the relation.
b. Write an equation to describe the relation.

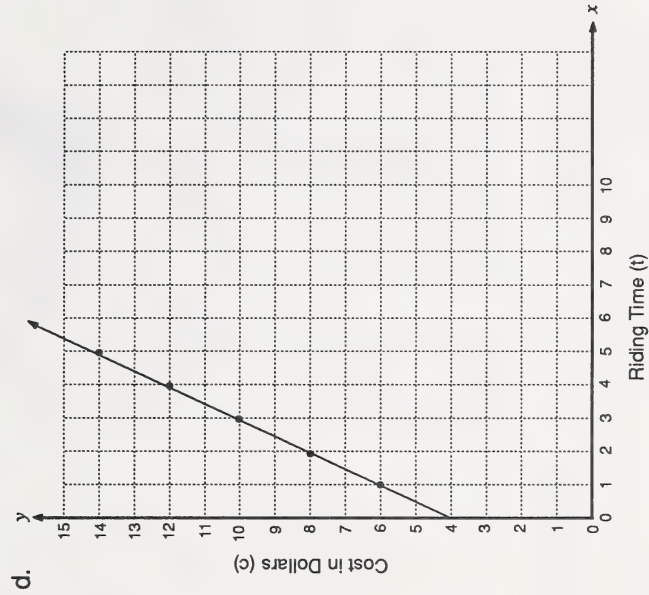
Suggested Answers

1. a. Two times the riding time plus four equals the cost.
b. $c = 4 + 2t$

- c. Write ordered pairs to describe the relation.

c. $(1, 6), (2, 8), (3, 10), (4, 12), (5, 14), \dots$

- d. Describe the relationship using a graph.



2. How is Rajah's hourly pay related to Nadia's hourly pay?



Nadia's Pay (f)	Relation	Rajah's Pay (g)
5	$5 - 1$	4
6	$6 - 1$	5
7	$7 - 1$	6
8	$8 - 1$	7
9	$9 - 1$	8

Describe the relationship several ways by using each of the following methods.

- Write words to describe the relation.
- Write an equation to describe the relation.

2. a. Nadia's pay minus one dollar is equal to Rajah's pay.

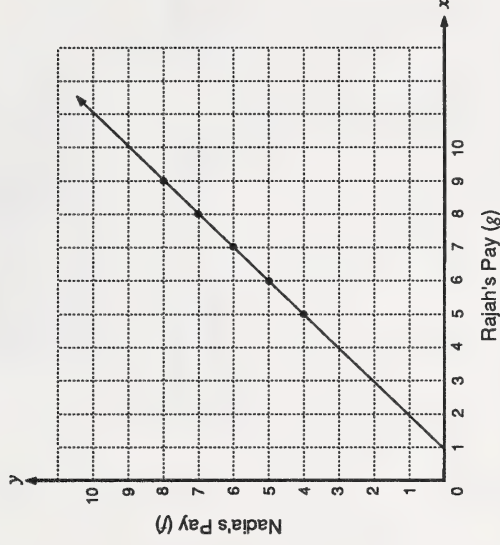
b. $g = f - 1$

- c. Write ordered pairs to describe the relation.

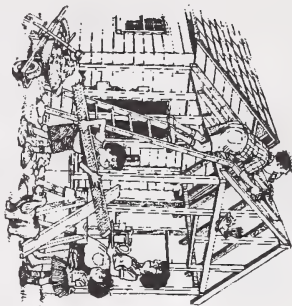
c. $(5, 4), (6, 5), (7, 6), (8, 7), (9, 8), \dots$

- d. Use a graph to describe the relation.

d.



3. How is the length (in metres) of the new room related to the width (in metres) of the new room?



Width In Metres (w)	Relation	Length In Metres (ℓ)
1	$2 \times 1 + 3$	5
2	$2 \times 2 + 3$	7
3	$2 \times 3 + 3$	9
4	$2 \times 4 + 3$	11
5	$2 \times 5 + 3$	13

Describe the relationship by using each of the following methods.

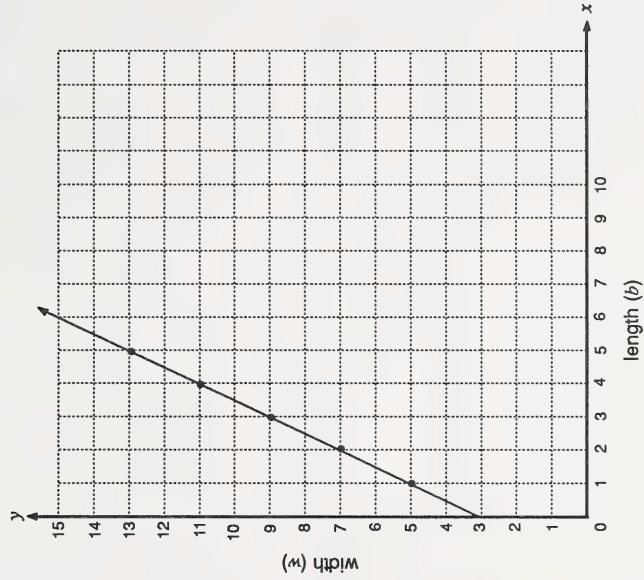
- a. Describe the relation using words.
3. a. Two times the width plus three metres equals the length.
- b. $\ell = 2w + 3$
- b. Describe the relation using an equation.

c. Describe the relation using ordered pairs.

c. $(1, 5), (2, 7), (3, 9), (4, 11), (5, 13), \dots$

d. Describe the relation using a graph.

d.



Concluding Activities

1. a. What are the next three terms of the following sequence?

5, 6, 7, 8, , , 

- b. Find the fiftieth term of the above sequence.

Suggested Answers

1. a. ..., 9, 10, 11

b.

Term	Relation	Number
1	$1 + 4$	5
2	$2 + 4$	6
3	$3 + 4$	7
4	$4 + 4$	8




The relation
is $n + 4$.

Evaluate $n + 4$ if $n = 50$.

$$50 + 4 = 54$$

The fiftieth term is 54.

2. a. What are the next three terms of the following sequence?

6, 9, 12, 15, , , 

- b. Find the fiftieth term of the above sequence.

2. a. ..., 18, 21, 24

b.

Term	Relation	Number
1	$(1 + 1) \times 3$	6
2	$(2 + 1) \times 3$	9
3	$(3 + 1) \times 3$	12
4	$(4 + 1) \times 3$	15




The relation
is $(n + 1) \times 3$.

Evaluate $(n + 1) \times 3$ if $n = 50$.

$$(50 + 1) \times 3 = 153$$

The fiftieth term is 153.

3. a. What are the next three terms of the following sequence?

8, 16, 24, 32, 40, , , .

- b. Find the fiftieth term of the above sequence.

3. a. ..., 48, 56, 64

b.

Term	Relation	Number
1	1×8	8
2	2×8	16
3	3×8	24
4	4×8	32
5	5×8	40

The relation
is $n \times 8$.

Evaluate $n \times 8$ if $n = 50$.

$$50 \times 8 = 400$$

The fiftieth term is 400.

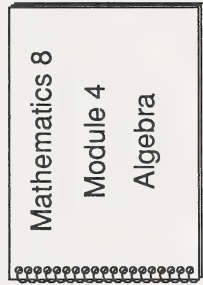
SUMMARY

What Lies Ahead

In this section the student will review the skills learned in Module 4.

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students check their answers to the pretest in Section 1.

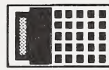
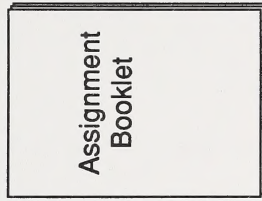
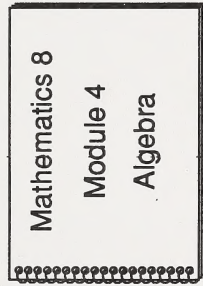
MODULE CONCLUSION

What Lies Ahead

The student is now ready to do the assignment in the Assignment Booklet. The student will be graded on the work done in this booklet.

Gathering Materials

The student will need the following items.



Guiding the Student

- Have the student complete the module assignment independently. The student may use resource material, but cannot get help. The student should attempt all parts of the assignment.
- Afterwards, you should both complete the declaration. You should submit the Assignment Booklet for a grade and feedback.

Introduction

The purpose of this study is to investigate the effects of various factors on the performance of a system. The study is divided into two main parts: a theoretical analysis and an experimental investigation.

Methodology

The methodology used in this study is a combination of theoretical analysis and experimental investigation. The theoretical analysis is based on the principles of system theory and the experimental investigation is based on the results of a series of experiments.

The results of the experiments are presented in the following sections. The first section presents the results of the theoretical analysis and the second section presents the results of the experimental investigation.

Results



CONCLUSION



MATH 8

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